Infectious Diseases and Aseptic Nursing Technique

A HAND-BOOK FOR NURSES

By

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TO MY WIFE

PREFACE

In offering this book the author has attempted to present the salient facts about infectious diseases which a nurse needs to know. Under Infectious Diseases have been included both acute and chronic diseases which are caused by germs and are transmissible from one person to another in whatever manner. No attempt has been made to include all communicable diseases; rather to include the more common diseases in this climate, which are presented in some detail, and to present a brief sketch of certain tropical diseases, some of which are endemic in the United States or are liable to be imported at any time.

The ordinary text-book on infectious diseases written for physicians is too elaborate for nurses. After more than fifteen years' experience lecturing to nurses at the Providence City Hospital the author has attempted in this volume to present the facts which are most useful to the nurse. To symptoms and signs only enough space has been devoted to present a concise outline of the principal features of each disease. On the other hand, nurses should be taught explicitly how infectious diseases are transmitted from one person to another, and how they can be prevented, for they come into closer contact with patients than even physicians do. Such knowledge is necessary if they are to be given the responsibility of preventing the spread of infection in the hospital and in the home, and also for their own protection. More and more nurses are being engaged in public health work and such knowledge is essential in this field. Likewise the treatment and nursing care of contagious patients should

receive particular attention if the nurse is to carry out intelligently the physicians' orders.

During the World War the United States Army authorities were unable to find enough physicians and nurses who had had training in contagious diseases to properly man their contagious hospitals. The leaders in the nursing profession have, ever since the war, earnestly endeavored to persuade general hospitals to include training in infectious disease hospitals as a necessary part of their training course.

This text-book, it is hoped, will assist in the education of nurses in infectious diseases. The contents of the book can be arranged to occupy about fifteen lectures. These fifteen lectures can be delivered during a three months' course, one lecture being given each week, arranging for two lectures a week during three weeks of the three months' course. The number of lectures and the grouping of subjects can, of course, be arranged to suit the lecturer, but the following grouping of subjects has been found satisfactory in the lecture course given in the special training-school of the Providence City Hospital.

Lecture I—Infection and Immunity
II—Diphtheria
III—Diphtheria, Treatment
IV—Scarlet Fever
V—Measles and Rubella
VI—Smallpox and Chickenpox
VII—Whooping-cough and Mumps
VIII—Gonorrhea
IX—Syphilis
X—Tuberculosis
XI—Influenza
Lobar pneumonia
XII—Acute Epidemic Meningitis
Acute Poliomyelitis
Erysipelas
Vincent's Infection

Lecture XIII—Typhoid Fever
Dysentery
Cholera
XIV—Anthrax
Rabies
Glanders
Tetanus
XV—Hookworm Disease
Leprosy
Malaria
Yellow Fever
Typhus Fever
Plague

Nursing technique in hospitals for the prevention of infection being carried from one patient to another has in the past been vague and not well executed. Since infectious diseases are usually transmitted by contact, direct and indirect, it is very important that the rules should be simple, stringent, and faithfully carried out. The Aseptic Technique printed at the end of this volume has been developed and used at the Providence City Hospital for several years and has been found to be simple and efficient. For use in other institutions it might have to be modified, but the essential details have been carefully worked out and they can be easily adapted to any construction and equipment.

On examining the curriculum for Schools of Nursing the author finds that the essentials, there laid down as necessary in the education of the nurse, are covered in this volume.

D. L. Richardson.

August, 1927.

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PART I

Infectious Diseases

INFECTION AND IMMUNITY

THE amount of suffering, the number of deaths, and the permanent physical damage done by infectious diseases can be only approximately estimated. Pneumonia alone stands third in the list of diseases which caused deaths in the United States in 1925, and health conditions were about normal. The ravages of epidemics are tremendous. The pandemic of influenza in 1918 attacked, it is estimated, some 200,000,000 persons and caused 10,000,000 deaths.

For these reasons infectious diseases are of more interest to health authorities than any other phase of their work. A tremendous amount of scientific investigation has been and is being done for the purpose of devising methods for the prevention and the cure of these diseases. Very much has been learned and great progress has been made in combating their ravages, but very much remains to be accomplished.

The essential knowledge necessary in outlining a program of effective prevention must include the following scientific facts: the cause of a disease; how the germs escape from the body and over what period; how the

germs enter the body under the natural conditions; effective preventive and curative treatment; accurate means of diagnosis and detection of carriers and immune persons.

When the germ cause of a disease is known and can be readily identified it is of very great help in diagnosis, in the discovery of carriers, and in determining when a patient is free from infection. The etiology of a large number of infectious diseases is known, but some have not as yet been discovered. Even when the cause is not known, if the routes by which the germs escape from the body, or the way they are transferred from one person to another, is known, very much can be accomplished in the prevention of such diseases.

The dissemination of each infectious disease is a special problem and requires special rules and measures for its control. Infectious diseases, however, fall into two rather natural groups—those which are transmitted by contact, either direct or indirect, such as scarlet fever, pneumonia and epidemic meningitis; and those which are disseminated in special ways, for example, malaria by the bite of malaria-infected mosquitoes, and typhus fever by the bite of infected body lice.

It was formerly believed, before so much was known about infectious disease transmission, that disease-producing germs were distributed through the air and by atmospheric currents. Malaria was thought to be caused by a *miasma* which arose from swamps. A smallpox patient was looked upon as a public menace and should be moved out of town to the proverbial pest house. People feared to walk on the same side of the street where a scarlet fever card was posted. Belief in atmospheric transmission has been corrected during recent years. Disease germs have been recovered from the air, but their presence is uncommon and they are few in number. In infectious disease hospitals in which different diseases are cared for on the same ward and even in the same room, provided the patients are kept apart and medical asepsis is employed, infection is rarely transmitted from one person to another.

Atmospheric transmission takes place only when a patient coughs in the face of a doctor or a nurse, or any one similarly exposed.

The dissemination of the contact diseases is brought about by direct or indirect contact with a patient sick with the disease, with someone who has had it in unrecognized form, or with carriers. The fresh secretions and excretions from a sick patient are dangerous, and they and everything soiled by them must be disinfected at once. Disease-producing germs for the most part have as their natural habitat the human body, and once they leave it they soon perish like fish out of water, particularly when exposed to sunlight and conditions of drying. In some instances, as, for example, in the case of plague and anthrax, man receives his infection from animals which are subject to these diseases. The belief that the germs of scarlet fever would live outside the body for long periods of time is entirely erroneous.

The germs enter through the mouth on anything that is put into it, including food and drink. The hands soiled with fresh secretions or excretions are the most common vehicle of indirect transmission of the common infectious diseases.

Not all persons into whose bodies disease-producing germs find their way are made sick by them. Several factors determine whether an exposed person will be attacked. The germs may be too few, are possessed of feeble virulence, or half dead from exposure outside the body, or the person may be immune to the disease.

It is well known that to produce disease there must be a sufficient number of germs present. It takes at least twelve tubercle bacilli to produce tuberculosis in a guinea-pig by inoculation. Not all germs have the same vigor or ability to produce disease. Some diphtheria germs are so feeble that they are not able to produce disease at all, while others cause only a mild attack.

The most important factor in the protection of the individual is immunity. Immunity is the ability which the

body possesses of resisting disease. It may be partial or complete. There are several kinds of immunity.

Natural immunity is the inherited resistance to certain diseases possessed by all the members of a species. For example, the lower animals never suffer from scarlet fever, measles, mumps, and other diseases to which man is susceptible. On the other hand, man is not susceptible to hog cholera, Texas fever, and other diseases common to certain animals. There is even a racial difference in susceptibility to certain diseases.

Acquired immunity is immunity established by individuals during life. It may be either active, which lasts over a period of years or a lifetime; or passive, which is protective for only a few weeks. Acquired immunity is established in several different ways:

(*a*) From the mother.
(*b*) By an attack of the disease.
(*c*) By injection of a virus.
(*d*) By injection of a vaccine.
(*e*) By injection of a toxin.
(*f*) By injection of a serum.

(*a*) During the development of the child in the uterus the mother transmits some immunity to her offspring. After birth it is supposed that her milk is also the source of immune bodies. However, it is well known that infants are less susceptible to infectious diseases than they are later. It is possible that part of this apparent immunity may be explained by the fact that older children do not handle and expose babies to infectious diseases so much as they do each other. This infant immunity is not lasting, for children of two to five years of age are very susceptible to infectious diseases.

(*b*) The protection afforded by one attack of a disease varies with the disease and the ability of the individual to manufacture protecting substances. However, immunity acquired in this way lasts years and may last a lifetime, and is called an active immunity. The number of persons who possess acquired immunity against scarlet fever and

diphtheria is much larger than the number who can give a history of these diseases. This is explained by the fact that many children have these diseases in mild unrecognized forms or have been germ carriers.

(*c*) Protection can also be induced by the injection of a virus. A virus is a preparation containing live germs in an attenuated state. The injection results in a mild attack of the disease by which immunity is established. Smallpox and rabies vaccines are examples of viruses. The immunity produced by the injecting of a virus is active, lasts for years, and is induced promptly after the injection.

(*d*) Active immunity can be induced by the injection of vaccines. Strictly speaking, a vaccine is a suspension of dead germs. However, it is a term wrongly applied to virus and sometimes to toxin. Vaccines are standardized by the number of germs each dose contains. Examples of vaccines are whooping-cough, typhoid, and gonococcus vaccines. Vaccines are not only used for conferring immunity, but are employed in the treatment of disease. The protection afforded by their injection lasts for some years, but some time must elapse before it is established.

(*e*) Toxins are another class of preparations used for inducing immunity. They are poisons produced by germs both in the body and by their growth in laboratory media. They are prepared by growing disease germs in liquid media, and, after the germs have been removed, the solution containing the toxins is tested and standardized by animal or human inoculations. Toxins are used not only for producing immunity but also for testing persons to determine whether they are susceptible to disease. Diphtheria and scarlet fever toxins and some tuberculins are examples of toxins. The immunity produced by toxins is active, requires a certain time to develop, and lasts for a considerable period.

(*f*) Passive immunity can be induced by the injection of immune serums containing antitoxins and is of short duration. The immunity begins almost immediately. The use of serum is confined to conferring protection to per-

sons who have been recently exposed to some contagious disease. Immune serums are more often used for treatment. They are obtained by bleeding animals, particularly horses, that have been inoculated with toxins or germs for the purpose of generating in their blood protecting substances called antitoxins, agglutinins, lysins, etc. The blood of human beings who have had an infectious disease also contains these protecting substances, and the serum of such persons, particularly those who have recently had the disease, is employed in the treatment of certain diseases. Diphtheria antitoxin, tetanus antitoxin, and human convalescent measles serum are examples of immune serums.

The length of time which immunity lasts, whether acquired naturally or artificially, depends upon the particular disease and certain little understood individual characteristics. Whether immunity is acquired naturally, or by artificial means, the process in the body is probably much the same. During the course of an infectious disease, for instance, the germs which cause it produce poisons, called toxins, which are chiefly responsible for the damage to the body. At the same time the toxin stimulates a reaction on the part of the blood and tissues which possess the power to manufacture substances which are capable of neutralizing the effects of toxin and the germs themselves. This explains why infectious diseases are self-limiting if the patient survives long enough. Of these protecting substances antitoxin is the most important. It is like an antidote, and is capable of destroying toxin by a complicated chemical process. The body also generates other protecting substances which attack the germs themselves, such as agglutinins, opsinins, lysins, etc. While many facts are known about bodily resistance to acute diseases there is much yet to be discovered.

Toxins and vaccines, when used for the purpose of finding whether a person is immune to a disease, are injected into the skin superficially for the purpose of observing the local reaction, or subcutaneously to test systemic reaction. In the Schick test and the Dick test the toxin is injected

superficially, and if the person is not immune there will be a small red inflammatory reaction, and vice versa. Whereas, when tuberculin is injected, if a person has tuberculosis, either the active or inactive form, the red inflammatory reaction which results indicates infection, while no reaction indicates that the person is free from the disease, although he may be susceptible. Vaccines and toxins are sometimes injected subcutaneously. If the person is immune, there will be neither local nor general reaction; but if susceptible, there will be a local reaction, a rise in temperature, and other systemic signs.

The administration of antitoxin, viruses, vaccines, and toxins are not infrequently followed by certain symptoms and signs, and in very rare instances the reaction may be alarming, particularly in the case of antitoxin.

The injection of an antitoxin is nearly always followed by a rise in temperature in a few hours accompanied by malaise, but this is of less than twenty-four hours' duration. Rarely symptoms of shock may appear in a few minutes after administration, particularly when it is given intravenously and, in very rare instances, one in several thousand administrations, the reaction may be fatal. These reactions are termed *anaphylaxis*. Severe and fatal reactions are more likely to occur in persons who are subject to hay-fever, asthma, eczema, erythema multiforme, urticaria, or persons who have previously received injections of any serum except human serum. Sensitive persons may be detected by injecting a few drops of serum into the skin, at the site of which an immediate local reaction will take place if the person is very sensitive. If he is sensitive it is possible to desensitize, or make it safe to administer serum, by injecting small increasing doses of the serum which it is desired to administer.

It is not uncommon for persons who have received serum treatment to show an urticarial eruption in from seven to fourteen days after administration. This eruption is commonly called an *antitoxin rash*. The eruption, like hives, is often very itchy and lasts from one to three

days. A moderate degree of temperature is nearly always present, and occasionally there are joint symptoms. The severity and frequency of this late reaction depends upon the kind of serum injected and the way it is prepared. After the administration of diphtheria antitoxin reactions are not so common, for this serum is now concentrated and certain objectionable substances have been removed. After the administration of other kinds of serums, such as pneumonia and antimeningitis serums, the rash is much more frequent, lasting, and intense. This late reaction is called *serum sickness*.

Serums are given by three routes—subcutaneously, intramuscularly, and intravenously. After the administration of serum there is more or less local swelling and redness. The amount of it is much less if the serum is given intramuscularly than when given subcutaneously. There are, however, no local reactions after intravenous injections, but the danger of immediate general reaction or anaphylaxis is much greater. In fact, a certain amount of shock, indicated by a chill, pallor, rapid breathing, apprehensive expression, etc., within one hour from the time of administration, is very common. The intravenous route, which often is to be preferred, is also the most dangerous and should be employed only when necessary. It should also be surrounded by all possible safeguards.

While systemic symptoms may follow the use of vaccine, toxins, and viruses, they are much less frequent and never serious. The reactions caused by them are local about the site of injection.

DIPHTHERIA

Definition.—Diphtheria is a disease characterized by the formation of a false membrane, usually in the throat, nose, or the larynx, accompanied with swelling in the throat and sometimes in the neck, and serious toxemia.

Etiology.—The disease is caused by the Klebs-Loeffler or *diphtheria bacillus*. This germ was discovered about 1884. It is an averaged-sized germ that takes several different forms. It is easily grown, but the medium which is most often used is blood-serum. It grows rapidly, and because of its peculiar shapes and arrangement, and because of the manner in which it stains, it is almost always possible to recognize the bacillus under the microscope without subjecting it to other tests. The germs are most often found in the nose and throat, but may also be found in the sputum or secretion that comes from the larynx, trachea, or lungs. They may be found occasionally in discharges from the ear and much more rarely in infected wounds. In making a diagnosis of diphtheria the physician depends not only upon the clinical picture of the disease but also, to a large extent, upon recovering the diphtheria germs from the nose and throat by culture or smear. Every case of sore throat that is even suspected of being diphtheria should be cultured. Cultures are taken from both nose and throat.

For taking cultures two tubes of media and another tube containing two sterile swabs are required. Swab first the nose, both nostrils, with one swab, passing it well within the cavity, and plant it in one tube of medium. Then culture the throat by passing the other sterile swab over both tonsils and plant it in the other tube of medium. It is important to label the tubes of media—one *nose* and the other *throat*—and to put the name of patient and date on each before taking the cultures, so they will

not get mixed. The media tubes are transferred to the laboratory, where the germs are grown over night or from twelve to eighteen hours. The culture is then examined. If it has been properly taken and there is sufficient growth, it is stained, examined, and reported either positive or negative, as the case may be.

Diphtheria is a contact disease and the germs must find their way by the transference of secretions from the nose and throat, rarely from the ear or wounds, of patients sick with diphtheria, into the nose and throat of healthy persons, to cause the disease.

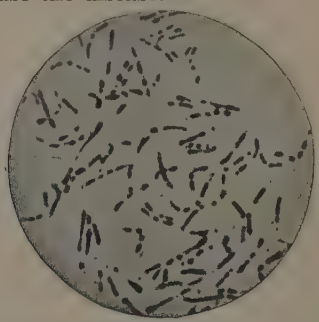

Fig. 1.—Bacillus of diphtheria, fifteen-hour serum culture. Loeffler's methylene-blue; × 2000 (Denny, Journal of Medical Research).

The patient is infectious from the beginning of symptoms and is kept in isolation, either in the hospital or in the home, until at least two negative cultures on successive days have been obtained. If a child is going to an institution where there are many other children it is wise to obtain at least four or five negative cultures before it is safe to discharge him. Most patients are free from the germs within a period of twenty-one to twenty-five days, but sometimes it is very difficult to get rid of them. These persons are called carriers. A person may be a carrier for weeks or even for months. In the hospital, if it becomes evident that the residence of the patient is going to be prolonged because the cultures continue to be positive, the

nose and throat are swabbed with some germicidal solution. The application of these solutions, however, is not very successful and it has been found that the only procedure of any real value is to remove the adenoids and tonsils. Occasionally this procedure also fails.

One attack of the disease often protects against a second attack, but not always. There is a method of determining whether a person is susceptible to diphtheria. It is called the Schick test. It consists of injecting into the skin about three minims of a specially prepared diphtheria toxin and watching the local reaction for a period of several days. In case a person is immune to diphtheria there will be no reaction. If a person is susceptible to diphtheria a small red area will appear in from twenty-four to forty-eight hours, which later becomes a little elevated, scaly, and lasts for several days.

In case a person is found susceptible to diphtheria there are two ways of immunizing him. The first is passively, by giving a small dose, 500 units or 1000 units, of diphtheria antitoxin in the same manner that it is administered in the treatment of the disease. Unfortunately, immunity produced in this way does not last very long—two, three, or perhaps four weeks. For this reason it is only valuable for the purpose of immunizing children in the same family where diphtheria exists, or in outbreaks of diphtheria in institutions where many children have been exposed to cases of the disease. There is a still better method of immunization, namely, the use of toxin-antitoxin. The toxin-antitoxin mixture for immunization is put up commercially in three vials, and three doses are given, each a week apart. The immunity, however, does not become established until three to six months have passed. To determine whether a person who has been given toxin-antitoxin has been really immunized another Schick test is done at the end of six months, and if it is positive the patient is reinoculated with toxin-antitoxin.

Sixty per cent., or thereabouts, of children under ten years of age are susceptible to diphtheria. Thousands

of school children and others have already been tested and immunized with the hope that diphtheria can eventually be controlled by this procedure. The reason why this method has been introduced is that the isolation of diphtheria patients has failed to stamp out the disease. The number of cases of diphtheria has shown little reduction during the last fifteen or twenty years.

Mortality.—Diphtheria kills from 10,000 to 12,000 children in the United States Registration Area every year. In hospitals the fatality rate is about 10 per cent., while in the community at large it is likely to be rather less because the hospitals receive all the bad cases, or most of them. If, however, every patient was given diphtheria antitoxin early enough there should scarcely ever be a death. It is not given in time because the parents do not call a physician early enough, or the physician fails to recognize the disease until it may be too late.

The Incubation Period.—Ordinarily it is from two to five days, but sometimes it is indefinite. That is, a person may be a diphtheria carrier for a long time, and, for some reason, suddenly develops the disease. This, however, is not a true incubation period.

Symptoms and Signs.—The most common types of the disease are the faucial, the nasal, and the laryngeal. Faucial diphtheria begins as a sore throat. The onset is not so abrupt as is that of scarlet fever. The sore throat is quite likely to be one-sided in the beginning, and if the throat is examined small patches of white membrane, or exudate, will be seen on one or both tonsils. These small patches of white material spread, coalesce, and form a sheet of membrane. This membrane tends to spread back in the pharynx, forward over the soft palate, sometimes downward toward the larynx, or up into the back part of the nose, the nasopharynx. It is firmly attached and forcible removal will cause bleeding. There is swelling of the throat and with it often there is redness, but redness is not so marked as in many other acute throat diseases. Not only is there swelling in the throat, which may be so

severe as to interfere with breathing, but the disease may cause swelling in the neck either on one or both sides. This swelling may be slight or it may be most extreme, including a great swelling in the neck below the angle of the jaw which may extend on to the face or down the neck to the chest. The temperature rises as the disease progresses during the first two or three days, then even in severe cases it is very common to see it fall, although the patient may be doomed. The pulse usually rises with the temperature, but it, too, often falls, even though the patient is growing progressively worse.

Nasal Diphtheria.—The symptoms are those of a beginning cold in the head with obstructed breathing, which is caused by the membrane and the swelling of the mucous membrane in the nose. Nasal discharge, at first serous, may become bloody or purulent. The bloody character of this discharge is due to the fact that if the membrane is disturbed it causes bleeding. Pieces of membrane, or whole casts of the nose, may be blown out.

Laryngeal Diphtheria.—This is the most serious form of diphtheria because it is more common in very young children, and because the body not only has to meet the toxemia of the disease but also the breathing of the patient is partly or completely obstructed. This form of the disease begins, ordinarily, with hoarseness and a croupy cough. Later on there is difficulty in breathing, indicated by a sinking in of the chest, called *retraction*, and cyanosis. The obstruction is expiratory as well as inspiratory, and is progressive until the child is exhausted and dies unless relieved. In this form of the disease the membrane and inflammation are not always confined to the larynx. It may spread down into the trachea, into the bronchi, and into the lungs, producing a bronchopneumonia. When the disease has spread well down into the trachea it is extremely serious and for two reasons. It may be impossible to overcome the obstruction to breathing because the intubation tube cannot reach through the obstruction, or becomes plugged with membrane; secondly, because the disease

process is so extensive that the patient may die from toxemia alone. Laryngeal diphtheria used to be called *membranous croup*. It is not easy to tell, in the early stages, whether one is dealing with acute laryngitis and *croup* or with laryngeal diphtheria. Ordinarily croup readily yields to a generous application of heat to the neck, while every case of laryngeal diphtheria generally gets steadily worse in spite of this treatment. The fatality of this form of diphtheria varies anywhere from 15 to 50 per cent. Before the days of intubation and antitoxin it was almost 100 per cent. Most cases are treated in a hospital, and should always be if there is a hospital available.

Other Forms of Diphtheria.—Occasionally discharges from the ears contain diphtheria bacilli. This may occur during the course of diphtheria or during the course of some other disease. It ordinarily is not very serious, not more serious than any common inflammation of the middle ear. Occasionally the diphtheria germs accidentally get into wounds of all kinds and produce inflammation and membrane; but it is quite rare, and is most likely to occur in institutions, particularly in hospitals. Diphtheria bacilli may often be found in nasal discharges of infants, but usually are not serious. In fact, diphtheria germs may cause sore throat without membrane, and nasal discharge without membrane. The number of such cases is much larger than is suspected.

Complications.—The most serious and most common injury inflicted by diphtheria is to the heart and circulation. Its effect is chiefly expended upon the heart muscle. Patients die either during the acute process of the disease or during convalescence, almost always before the end of the second week. When they die during the acute process the pulse becomes feeble and irregular and a very low blood-pressure is noted. Sometimes there is a partial or complete suppression of the urine. The patient dies of acute toxemia. On the other hand, the patient may seem to be recovering, and the throat may be practically cleared of inflammation; and one day the child is observed to be-

come very white and very prostrated. The pulse becomes very feeble and disappears from the wrist, after which the patient may live for even twenty-four to forty-eight hours. Vomiting at this time is usually indicative of a fatal termination. The damage to the heart, however, does not always lead to a fatal termination. Poor cardiac function may last for months or even years.

The next most common complication is paralysis. Paralyses may develop even before the throat is cleared of the membrane and inflammation; but these early paralyses always affect only the throat, or they may come on weeks or even months after the disease has apparently been cured. They may be very slight, or may be so extensive that the patient is helpless. The most common forms of paralyses are of the soft palate, indicated by regurgitation of fluid through the nose during drinking, paralyses of the muscles of swallowing, either partial or complete, strabismus, weakness of the muscles of the back of the neck, weakness of an arm or a leg, or of the muscles of the back or abdomen. Except in those cases where the heart is seriously involved, patients, no matter how extensive may be the paralyses, will recover with rest and good care, although recovery may take several weeks or months in the more severe cases.

Acute otitis media occurs in about 5 per cent. of the diphtheria patients. Acute nephritis occurs during the more severe forms of the disease, but it comes on during the acute process. It is rare for it to develop during convalescence. Bronchopneumonia is very common in laryngeal diphtheria.

Prognosis.—Every patient suffering from diphtheria who is given antitoxin early enough will get well. Unfortunately, either because the parents do not realize how sick the child is, and do not consult a doctor; or because the doctor does not recognize the disease early, precious time is lost, and it may be too late to expect results from antitoxin. Scarcely ever will a child die if the diphtheria antitoxin is given during the first two days of the disease.

In the faucial type, when there is marked swelling in the throat, and particularly in the neck, it indicates a serious form of the disease. Any child under ten years of age who, when first seen, has well-marked bilateral swelling in the neck, called *edema* of the neck, will usually die, even though large doses of antitoxin are given. Adults or adolescents may recover even if the disease has progressed thus far, but the younger the child, the less chance there is of recovery. It is usually possible to foretell whether a child with faucial diphtheria is going to get well or not when he enters the hospital.

Treatment.—There is a specific treatment for diphtheria which is really curative, namely, diphtheria antitoxin. When a patient has diphtheria, during the course of the disease there is formed in the throat, or wherever the disease exists, a poison called diphtheria toxin, which is absorbed and circulates through the body. In some manner, the details of which we do not altogether understand, it produces a reaction on the part of the body which produces a substance that counteracts the effect of the toxin. This substance is called antitoxin. That is, every patient who gets diphtheria makes his own antitoxin, but the difficulty is that he is unable always to make a sufficient amount rapidly enough to save life.

In 1890 Behring, a German, announced that he had been able to produce antitoxin in animals by injecting large doses of dead diphtheria bacilli. Since this investigation it has been found that it is not necessary to inject the diphtheria germs, and that injection of diphtheria toxin alone will produce the same result.

At the present time the method of preparation of diphtheria antitoxin is pretty well standardized. Most companies in this country utilize one or two strains of diphtheria bacilli, which were isolated many years ago, in the preparation of diphtheria antitoxin. The process, briefly, is as follows: Horses which have been previously examined and found to be healthy are injected with increasing doses of diphtheria toxin. From time to time the blood

of the horses is tested to find out how much antitoxin it contains. When it has reached a proper strength, the horses are bled, the serum separated, and after being tested for its strength, it is treated so that it will keep, and is put up in syringes or vials. The most common commercial packages in use at the present time contain 5000 units, 10,000 units, or 20,000 units. A unit, which is the measure of the strength of antitoxin, is that amount of antitoxin which will protect a guinea-pig weighing 250 grams against one hundred times a fatal dose of diphtheria toxin. Formerly the whole serum was used in the treatment of diphtheria. It was found to be bulky and the reactions after its use were frequent and very troublesome. During recent years after much investigation it was found that the antitoxin is attached to the globulin, one of the albumen constituents of the serum. By removing the globulin the bulk is much reduced until, roughly speaking, 1 c.c. of serum contains about 1000 units of antitoxin. Commercial antitoxin is a straw-colored liquid, heavier than water, and should be clear or fairly clear. However, it not infrequently is found to be cloudy, and there is nothing wrong about a cloudy serum if it has been properly cared for from the time it was prepared. Various lots of serum differ in their clarity. A clear serum should be picked for intravenous treatment, for reactions are much less when this is done. It is highly important that diphtheria antitoxin be kept on ice from the time it has been prepared until it is needed for treatment. If, as formerly happened not infrequently, it comes in contact with a sufficient amount of heat during transportation, in a drug store or hospital, its value may be entirely destroyed.

Antitoxin is given in two ways. Most commonly it is administered intramuscularly. In severe or very rapidly progressing cases, simultaneously a dose should be given intravenously. The intramuscular dosage varies in general from 5000 to 30,000 or 40,000 units, depending upon the severity and the rapidity of the progress of the disease. Occasionally larger doses are administered. Intra-

venous doses vary in size, but usually are from 10,000 to 20,000 units, although larger doses may be given. The ordinary case is treated intramuscularly. The best place to administer it is in the outer aspect of the thigh at its most prominent part where there is a large amount of muscle covered by a comparatively thin layer of subcutaneous tissue. This site is selected for two or three reasons. The first is that it is less likely that the serum will be injected into the subcutaneous tissue instead of muscle tissue, for it is very important that every dose of antitoxin that is administered should reach muscle tissue. The fatty tissue under the skin has very few blood-vessels and antitoxin is so slowly absorbed that valuable time may be lost. The administration of antitoxin in the thigh is more comfortable for the patient than almost any other site in the body. The local reaction and danger of abscess is also much less.

The Administration of Antitoxin.—Antitoxin should be taken off the ice for a little while before administration and warmed very slightly, enough to take off the chill. It is also important that the syringe be not more than lukewarm, because if either the antitoxin or the syringe is too warm the syringe piston will stick because of some coagulation of the serum. A Luer glass syringe is to be preferred, with a stout needle $1\frac{1}{2}$ inches long and about gauge 19. The area should be first painted with iodin. After the syringe has been filled with antitoxin and the air has been expelled, the tissue of the outer aspect of the thigh should be picked up and the needle inserted with one quick thrust deep into the muscle. The serum should be expelled from the syringe slowly, however, because sudden swelling of the tissue from injected fluid is painful. The physician always gives the intravenous dose because there is much more risk in its administration than when given by the intramuscular route, but there is no reason why a nurse, who has had experience, should not administer antitoxin intramuscularly under direction.

Antitoxin is not entirely harmless. There are some per-

sons who are very susceptible to any serum, and very rarely a serious reaction may occur immediately after its administration. It may even be fatal, but this is exceedingly rare. This kind of reaction is far more common after administration by the intravenous route than when it is given intramuscularly. Very often after intravenous administration of antitoxin the patient will, within an hour, have a chill, a little increased breathing, an anxious expression of the face, some pallor, while the pulse may not be disturbed. Sometimes this reaction is alarming, but ordinarily it soon passes off without doing any harm.

Whether antitoxin has been introduced intramuscularly or intravenously, in from seven to fourteen days after it has been given, and in a certain percentage of patients, *serum sickness* occurs. This consists chiefly of an urticarial eruption which commonly is diffused over the body, including the face, and itches intensely. With it there is usually a rise of temperature. Rarely the joints may become painful and tender. This condition does not last over twenty-four to forty-eight hours, and only occurs in a small percentage of cases. Serum sickness is never fatal.

The second most important thing in the treatment of diphtheria, after the use of antitoxin, is rest. If a child who has a frank or serious attack of diphtheria is allowed out of bed too soon, there is always danger of a sudden collapse, and perhaps death. Such sudden deaths during convalescence from diphtheria used to be not infrequent. During the acute process of the disease the child should, particularly if he is very ill, be fed in a lying position, and should not, under any circumstances, be allowed to sit up or exert himself unduly. For the sore throat of faucial diphtheria frequent hot irrigations of one to two quarts of saline or some other mild solution will give temporary relief. The use of the ice collar is important and such other symptomatic treatment as is indicated by the condition of the patient. Forcible removal of the membrane, either by violent blowing of the nose or disturbance when cultures are being taken, may produce bleeding.

In the treatment of laryngeal diphtheria in addition to the use of antitoxin it is necessary to relieve the obstruction to breathing. When the patient is first seen it may not always be necessary to intube, a procedure by which this difficult breathing is overcome. Many patients, however, need relief at once. While watching a patient and hoping that intubation may not be necessary, it is very important to keep that child under close observation. There is no more exhausting condition than obstruction to breathing, and children, particularly small children, sometimes collapse very quickly, even when the general appearance does not seem to indicate a serious condition. The best guide to early recognition of approaching exhaustion is to take the pulse every twenty minutes or half hour, and if it begins to creep up to 140, 150, 160, it indicates the approach of exhaustion and intubation should not be longer delayed.

Intubation as now practised was introduced in a practical way by Dr. O'Dwyer of New York. It consists of the introduction of a hollow tube into the larynx, and the removal of the tube is called extubation. The instruments used in addition to the tube are: the obturator which fits into the tube, the introducer, a wedge-shaped wooden mouth-gag for opening the mouth when tightly closed, an ordinary metal mouth gag to hold the mouth open during intubation, a pair of scissors to cut the string, an extractor for the removal of the tube, and a small measure that comes with every set for measuring the size of the tube. This measure is graduated in years instead of linear measurement, so that it is possible to quickly select the proper sized tube for the child. Two tubes suitable for each patient, fitted with their obturators and fitted to two introducers, should always be ready for use. It may be necessary to withdraw the first tube and reinsert another in a hurry, and it is important to have a second tube ready for instant use, as one sometimes has to work very rapidly to save life. The string in the tube should be cut about 15 inches in length over all, and then threaded into the

tube and tied. It should be a coarse cotton or silk thread. If a nurse is going to assist the doctor in intubation she will stand at the head of the patient, after having wrapped the child in such a manner that the arms are pinned to the side and a roll has been placed under the back of the neck. She will put the gag in the left corner of the mouth, providing the doctor is a right-handed man. She should steady the head and mouth gag during intubation. Ordinarily the string is cut and removed after intubation. The child is put back to bed and, if the breathing has been relieved, he will commonly go to sleep at once from sheer exhaustion. Intubation tubes are left in from four to seven days, depending upon the condition of the child. They are removed by a process called extubation. The next two or three hours after extubation is a very critical time, because if an extubed child can get by this period without reintubation he usually will not have to be reintubed. It is important for the nurse to take the child in her arms and to rock it, if necessary, to overcome the element of fright. The nurse has done a great deal if she is successful in quieting a child, thus overcoming the necessity of reintubation. As long as the tube is in the larynyx it is very important that a nurse be with the child night and day, never leaving the room. She should always have at hand all the necessary intubation instruments in good working order, for the physician, if called because the child is breathing badly, will come on the run and the delay over instruments of even a few seconds sometimes may result in the loss of the child's life.

There should always be ready, in addition to the intubation set, instruments for a tracheotomy. Tracheotomy is an operation consisting of opening the trachea or windpipe below the larynx. The instruments that are absolutely essential for the tracheotomy are three—a sharp knife, a short, curved French clamp, and a tracheal tube suitable for the age of the child. There should always be at hand small hemostats, two small retractors, catgut, a flexible cotton applicator for wiping out the trachea if

necessary, and sterile cotton and sponges. These instruments should be sterile and on a tray. Tracheotomy, as is practised in this country, is usually an emergency operation and is done after intubation fails. The membrane in the trachea may extend so far down that when the intubation tube is introduced it simply stuffs the trachea full of membrane or plugs the tube and shuts off the breathing. Sometimes this membrane can be dislodged by removal of the tube, followed by forcible sudden compression on the chest and the coughing of the patient. If this fails, then it is necessary to do a rapid tracheotomy without any previous sterilization of the skin or operator's hands.

In a small percentage of cases it is found impossible for a child to go without the laryngeal tube after many extubations. After continuous intubation over a period of a few weeks it is best to do a tracheotomy. At this tracheotomy one has plenty of time to do a careful operation, because the laryngeal tube is in the larynx throughout the operation. This condition is called stenosis of the larynx. Most cases will recover after varying periods of treatment if a tracheotomy is done early enough and before much damage to the larynx has been caused by the tube. After removal of the laryngeal tube the larynx tends to heal, but it is usually necessary to dilate it at intervals so that the normal passage will be reinstated.

It is important for the nurse to be on the lookout for certain complications of diphtheria. If a patient, particularly during early convalescence, gets very white and prostrated, or his pulse becomes feeble or irregular, it is evident that his heart is seriously affected, and if he vomits it almost always indicates a fatal outcome. If while drinking, fluid comes out of the nose, or there is a nasal twang to the voice, the soft palate has been paralyzed. It is important to watch for other paralyses, which are easy to overlook, particularly in children too young to walk.

VINCENT'S INFECTION

INCLUDING Vincent's angina and stomatitis; and noma.

Definition.—Vincent's infection is characterized by a destructive inflammation of the tissues in the throat or mouth.

Etiology and Epidemiology.—It is caused by Vincent's fusiform bacilli and spirillæ.

It occurs most frequently in institutions for children and is spread by contact. It occurs among poorly nourished children and among those convalescing from acute diseases, particularly from measles.

There are all gradations of severity, from a small patch of exudate in the throat, or a mild pyorrhea, to a very destructive process of the tissues of the mouth and face, attended with severe toxemia and a high fatality rate.

Diagnosis is made by finding large numbers of the combined organisms in smears from affected tissues. A few germs have no significance, for they and similar germs are found in normal mouths. All cases should be isolated and not released until symptoms and signs have subsided and the germs have disappeared.

Treatment.—There is no preventive, and treatment consists of cleanliness of the mouth and throat and good nursing care. Sometimes arsphenamin is given intravenously for noma, with varying results. The most useful local application is tincture of iodin. Surgical measures in noma are likely to lead to greater extension of the disease and should be confined to the careful removal of dead tissue only.

SCARLET FEVER

Definition.—Scarlet fever is an acute disease, characterized by sudden onset with fever, sore throat, vomiting, and by the appearance, usually on the second day, of a diffuse red eruption over the body and extremities.

Etiology and Epidemiology.—The cause of the disease is probably the *scarlet fever hemolytic streptococcus*. The belief that this is the germ responsible for scarlet fever is due to experiments of Dr. and Mrs. Dick, who inoculated human beings with them and produced the disease. The germs are in the secretions of the nose and throat, in discharges from the ears, in discharges from wounds in persons sick with the disease, but not in the desquamation. The patient is infectious from the beginning of symptoms and continues to be infectious for a period of some weeks. The usual hospital isolation period is four or five weeks. Houses where the disease exists are placarded for three to six weeks, depending on local regulations. At the end of the hospital isolation period, if there is no discharge from the nose, no discharge from the ears, if the tonsils and throat are not red and swollen, and if there are no tender glands in the neck, patients are sent home as probably non-infectious. If any of these complications are present the patient is detained until these conditions have been relieved. As a matter of fact, however, a certain percentage of discharged patients, even when all these precautions are taken, are carriers of the scarlet fever streptococcus and take the disease home to some other member of the family. This happens in about 3 to 5 per cent. of discharged hospital cases.

A toxin and a serum has been made from this scarlet fever streptococcus. The toxin is prepared in the laboratory by growing the germs in certain liquid media, and after the germs are removed and the liquid in which they

have been growing has been properly prepared, it is tested by injecting a small amount of it into the skin of known susceptible and insusceptible subjects to test its reliability and strength. After it has been properly diluted it is ready for use and is marketed in vials.

Scarlet fever antitoxin is prepared in three ways. The animals used are horses and they are injected either with the toxin, the germs themselves, or both the toxin and the germs. The dosage is increased and the serum of the horses is tested at intervals for its potency. The strength of the serum is measured in units, a unit being an amount sufficient to neutralize one skin test dose of the vaccine. It is put up ordinarily in syringes or vials, each containing 10 to 20 c.c., the strength of each dose being marked in terms of skin test doses. Some of it is concentrated much as diphtheria serum is concentrated, and each dose is smaller in quantity than when it is not concentrated.

Scarlet fever is a disease which is found in all parts of the world. It is more common in some countries than in others. It is always present in the larger cities, being more prevalent during the cold months. It appears every few years, however, in epidemics of greater or less severity. In years gone by it was a much more serious disease than it is now. Fifty or sixty years ago it was the most dreaded of all the common infectious diseases in England. During the last twenty years it has become a much milder disease in such countries as Great Britain, Scandinavia, France, Germany, and the United States. The fatality rate, even in hospitals, is as low as 2 per cent. On the other hand, at the present time in eastern Europe the fatality rate is still 18 to 20 per cent., and in China it is even higher. The explanation of this decrease in severity is not an easy one. In the first place the virulence of infectious diseases travel in cycles. The present may be a period of low virulence in the countries mentioned. There is, however, another explanation which is certainly worthy of serious consideration. In the countries where the fatality rate is low, isolation of scarlet fever in the home and in hospitals

has been going on for many years. The public thus has been protected against the more severe types of the disease, particularly by hospital isolation, for the hospital receives most of the serious cases. On the other hand, milder cases, many of which are never recognized, spread a mild type of the disease.

One attack of scarlet fever usually protects against a second attack, although two and even three attacks do occur.

It is possible to determine whether a person is susceptible to scarlet fever or not by employing the Dick test. This consists of the injection superficially in the skin of a small amount of scarlet fever toxin and the observation of the local reaction during the next twenty-two to twenty-four hours. If there is no redness around the site of injection within twenty-four hours or thereabouts, it means that the person is immune to scarlet fever and vice versa. In testing large numbers of people it is found that about the same number of persons are susceptible to scarlet fever as are susceptible to diphtheria for the same age groups. This conclusion is arrived at by comparing the results of the Dick test and the Schick test.

It is claimed that immunity against scarlet fever can be produced. Passive immunity, which may last for two or three weeks, can be brought about by the injection of a certain amount of scarlet fever antitoxin or either the serum or blood from a patient who has recently recovered from scarlet fever. Active immunity is produced by the subcutaneous injection of small increasing doses of scarlet fever toxin. At the present time the Dicks are recommending about five injections of toxin at intervals of five to seven days. The immunity apparently comes on much sooner than that produced by the administration of diphtheria toxin-antitoxin. How long this active immunity will last no one knows as yet.

Incubation Period.—The incubation period of scarlet fever is from two to seven days. Occasionally it may be shorter or longer.

Symptoms and Signs.—*A Typical Case.*—Its onset is sudden, with fever, sore throat, and vomiting. The rash in children appears usually on the second day and rarely later than the third day. In adults the appearance of the rash may be delayed even as long as a week.

The temperature rises very rapidly to 102° or 104° F. Rarely it may be as low as 99° or 100° F. It falls to normal within three or four days to a week, depending upon the severity of the disease. Occasionally the temperature may last ten days to two weeks. The pulse is very rapid in the early stage, more rapid than the temperature would account for. The throat is usually diffusely red, may be slightly or greatly swollen, and exudate may be present on the tonsils in severe cases. This exudate is rarely due to accompanying diphtheria, usually being a manifesitation of scarlet fever itself. The tongue is at first covered with a white coating which in all except very ill patients desquamates very rapidly, first on the sides and tip. In many scarlet fever patients the raw, red tongue left after desquamation is studded with enlarged papillæ, the so-called *strawberry tongue.* The frequency with which the strawberry tongue is present depends to some extent on the severity of the disease, but also varies in the different outbreaks. It is much less common than generally believed. Vomiting is a very common sign in scarlet fever and is valuable in diagnosis. The onset in infants may be ushered in by a convulsion.

The eruption is a diffuse, red eruption, first appearing upon the neck and chest, later spreading over the body within twenty-four to forty-eight hours. Frequently the natural redness of the face is intensified, but usually there is little eruption upon the face. The rash lasts three or four days. It may be very transient, lasting only a few hours; or it may last several days, particularly when it is intense. Sometimes the rash is more or less blotchy, particularly on the arms and legs, and even on the lower part of the trunk. Subsequently the eruption is followed by desquamation. The amount of that desquamation and

the rapidity with which it begins usually depends upon the intensity of the rash. It is usually first seen around the neck and the region of the groins. Typically, in the beginning, it is sieve-like in appearance, later becoming flaky or peeling in character. Within a week or ten days peeling begins on the hands and feet, first on the fingers and toes, and later on the palms and soles. Some cases desquamate rapidly, others much more slowly. Most patients have completed or nearly completed desquamation by the end of four weeks. It is first completed on the body and is last seen on the palms and soles. Formerly no patient was discharged from the hospital with any vestige of desquamation, but no attention is paid to it at the present time.

Atypical Forms.—Any one of the cardinal symptoms of scarlet fever may be absent. It is by no means always accompanied by an eruption. Any sore throat, particularly when associated with fever and constitutional symptoms, with or without vomiting, may be due to the scarlet fever germ. These missed cases are very frequent, just as they are in diphtheria. Sometimes the symptoms are very mild, the temperature being only 99° to 100° F., even when attended by an eruption. Abnormal forms of scarlet fever can be recognized with some degree of accuracy if they occur in families where scarlet fever exists or among contacts of the disease.

Complications.—One of the most frequent complications and one which appears not only in the acute stage, but during convalescence, is cervical adenitis. Cervical adenitis is due to the infection of the throat. It usually subsides under local treatment, but sometimes it goes on to abscess formation. Persistent rhinitis occurs during convalescence very commonly. Acute transient arthritis is seen, particularly during the acute process. Acute nephritis, or Bright's disease, appears during convalescence. The frequency of nephritis, however, is much less than is commonly believed. Patients who are treated promptly almost always recover, and rarely is there any permanent

damage to the kidneys. The most common damage to the heart is myocarditis, which is indicated by a slow return of strength after the acute process of the disease and by a small and often irregular pulse. Endocarditis and pericarditis also occur, but they are now rare. Otitis media occurs in about 12 per cent. of the cases, and this may go on to mastoiditis. Faucial diphtheria is also associated with scarlet fever in a small percentage of cases. Relapses within three or four weeks of the onset of the disease are not uncommon, but they are almost always mild. Some of these supposed relapses are really first infections, the diagnosis having been wrongly made in the beginning. Pneumonia is a very rare complication.

Types According to Severity.—The disease appears in different degrees of severity. There is the very mild; the ordinary; the malignant, in which the patient may die within twenty-four or forty-eight hours and in which the rash is lacking or poorly developed; the hemorrhagic, which is attended with severe symptoms and a hemorrhagic eruption, bleeding from the mouth, nose, and rectum; and the anginoid, in which the throat symptoms are very severe and accompanied by marked cervical adenitis or cellulitis.

Treatment.—The specific treatment of scarlet fever with scarlet fever serum while valuable is not always curative. Scarlet fever serum should be given in selected cases. One dose, intramuscularly, rarely intravenously, should be given and repeated if necessary. Whole blood or serum taken from recent scarlet fever convalescents has been used with good results, but their use has been largely supplanted by the new scarlet fever serum. Rest in bed for children, preferably three weeks, and for adults, at least two weeks, should be insisted upon. The danger of allowing patients to become ambulatory too soon is that convalescence may be delayed, and they are more likely to have some of the complications which may occur at any time within five weeks from the onset of the disease. During the acute process of the disease plenty of fluids,

warm baths for delirium and restlessness, an ice collar, attention to the mouth and throat are important factors in treatment

Diet.—Because of the frequent occurrence of acute nephritis during scarlet fever, meats, eggs, and other proteins have been excluded from the diet. Patients have even been kept on a milk diet for three or four weeks. Experience has shown that protein foods do not precipitate an acute nephritis, but once it has appeared they should be withdrawn. The diet should consist of milk and other liquids during the height of the disease. When convalescence begins, a light diet, followed shortly by a full diet, should be given. Convalescents improve faster and appear much more robust on a fairly generous diet than on a light or milk diet.

Danger Signals.—Signs of the complications which come on during both the acute process and during convalescence should be watched for. Pain in the ear or discharge indicate acute otitis media. Pallor, puffiness of the face, or decrease in the urine herald the onset of nephritis. Changes in the pulse may indicate a heart complication. Sore throat during convalescence may be due to tonsillitis of convalescence or to diphtheria.

PERTUSSIS—WHOOPING-COUGH

Definition.—Whooping-cough is a disease characterized by an acute inflammation of the respiratory system and by a peculiar and characteristic cough.

Etiology.—The cause of whooping-cough is the *Bordet-Gengou bacillus.* This germ can be found in the secretions of the nose and throat, but is easiest recovered from the mucus which is coughed up. It is a very small organism, very hard to cultivate, and is isolated with considerable difficulty. Practically it can be recovered only during the early stages of the disease before the mucus from the lungs becomes purulent due to secondary infection. In the later stages of the disease this germ is overgrown in cultures and difficult to separate from the many other germs which are found in the bronchial secretions.

A vaccine has been produced by growing these bacilli, killing them, and standardizing the suspension by the number of organisms it contains. The vaccine is used for two purposes, first as a prophylactic, and secondly in the treatment of the disease. Its value as a prophylactic inoculation has not been thoroughly established, but there is enough data available to indicate that it will, in a certain percentage of cases, prevent the disease if given early enough. It is ordinarily given in three doses at intervals of five to seven days. Its value in treatment is less certain. It was formerly used quite extensively and is still employed, particularly in private practice, but in hospitals it is not very commonly used at the present time. The size of the treatment dose and the number of doses required depends upon the particular needs of the patient.

Epidemiology.—Whooping-cough is a very contagious disease and is widely distributed in all parts of the world. The germs escape from the body in the secretions of the nose, throat, and particularly in the bronchial mucus. The

patient is infectious from the earliest catarrhal symptoms, which begin anywhere from one to two weeks before the disease is recognized. All efforts to control epidemics have been practically ineffective. There are two reasons for this. One is that the patient is infectious for so long before the disease is recognized and during this period the patient is not ill enough, usually, to be confined to the house. The second reason is that many cases of whooping-cough are overlooked. It is rather widely believed that all patients suffering from whooping-cough must *whoop*, but, as a matter of fact, a certain percentage of cases never get beyond the paroxysmal stage, and some even show only mild catarrhal symptoms without paroxysms. It is more or less commonly believed that whooping-cough is a disease of childhood only, but a great many adults have whooping-cough and it usually is not recognized. It not infrequently happens that one or both parents contract mild whooping-cough when their children have the disease. Attacks of whooping-cough in adults may occur, even though they may have had it in childhood. One attack, however, usually protects against a second attack, at least for many years; and second attacks are usually mild, probably because of some remaining immunity.

Mortality.—Whooping-cough is a very serious disease to child life. It kills more children than diphtheria or measles and several times the number that die from scarlet fever. It is serious in children under five years of age and particularly under two years.

Incubation Period.—The incubation period is between two and three weeks.

Symptoms and Signs.—*A Typical Case.*—The patient first has catarrhal symptoms, of which cough is the most noticeable. It is at first a dry, hacking cough, which later appears in *spells* or *paroxysms*, the interval between the paroxysms being quite free from cough. This interval varies with the stage of the disease and the severity of the attack. The interval may be half an hour or even several hours. During the paroxysms the patient ut-

ters a series of short coughs, holding his breath until he becomes blue in the face, and this may end that particular paroxysm; or, after taking a breath, he may have a second or third series of short coughs until he is quite cyanotic and exhausted. When the disease is at its height, and while the patient is taking in his breath during the paroxysm, the effort produces a peculiar crow, called the *whoop*. The obstruction to inspiration is due to spasms of the vocal cords. The cause of the cough and the paroxysms is due to the inflammation of the trachea and of the bronchial mucous membrane. In the early stages the cough is dry. Later on mucus collects in the bronchi and nature attempts to get rid of this mucus by the paroxysm which is often assisted by vomiting. Once the child gets rid of the mucus that particular paroxysm ends. If the lungs are examined before a paroxysm large numbers of coarse râles will be heard over any part of the chest, but after a paroxysm the râles nearly all disappear. An uncomplicated case of whooping-cough should not have a temperature over 99° or 100° F. If a persistent temperature of more than this is found it usually means that there is some added pulmonary complication. Whooping-cough saps the vitality of every patient because of the toxemia of the disease itself, the severe coughing, and also because of the frequent vomiting. The vomiting is particularly serious in infants who are difficult enough to feed even during ordinary health.

The disease lasts from four to six weeks ordinarily, reaches its height at practically about the third or fourth week, and then gradually subsides. Children, however, not infrequently suffer from occasional paroxysms for several weeks, or even for several months. Sometimes the disease after apparent lessening in severity, or even after the child has ceased to cough, will relapse.

Atypical Cases.—Very many cases of whooping-cough never get beyond the paroxysmal stage and never whoop. A few may suffer only from a cough which is not very suggestive of whooping-cough. The milder attacks occur not

only in persons who have had the disease before but also in those who have it for the first time.

Complications.—Because of the severity of the cough certain conditions arise. One is *blood-shot eyes* due to hemorrhage underneath the conjunctiva. Nosebleed is quite common. Tiny hemorrhages under the skin occasionally are seen. The faces of whooping-cough patients look puffy, and in babies the arms and legs sometimes become swollen. Hernia sometimes develops because of the severity of the paroxysms. Very rarely edema of the brain or hemorrhage into the brain may occur.

Occasionally otitis media will occur. Pulmonary tuberculosis sometimes follows the disease, although occasionally a case of pulmonary tuberculosis is wrongly diagnosed as whooping-cough.

The two most serious complications, however, are bronchopneumonia and malnutrition, particularly in infants. These two complications are the cause of nearly all the deaths.

Treatment.—There is no specific treatment except pertussis vaccine, which is of uncertain value. A great deal, however, can be done to make the disease more bearable and to save life. The most important thing is rest, certainly during the most active period of the disease. If the child is put to bed during the height of the disease the paroxysms will decrease in number and severity without any other treatment. Another reason for putting children to bed is to prevent exposure and thereby, perhaps, prevent bronchopneumonia. In years gone by it was customary to keep the room in which the whooping-cough patient was being treated very warm and the windows closed, and various kinds of inhalations were used. It is very important, however, to avoid this and give the patient plenty of fresh air, but not extremely cold air. Inhalations are of little value and are sometimes harmful. Unless it is a rather severe or protracted attack the patient's appetite is not affected to any great degree. Plenty of good, nourishing food should be administered, and this

is particularly important in babies. Babies should be fed immediately after any paroxysm during which they have vomited. In this way the nutrition of the patient may be kept up to something like normal.

There are many drugs used in the treatment of whooping-cough. The most popular and the most used are such drugs as will decrease the severity and number of the paroxysms. If sedatives are given, some form of opium is the most efficacious, and in the later stages atropin may help to limit the bronchial secretions. In the later stages of the disease it is a mistake to use sedatives too freely because the paroxysms are nature's method of getting rid of the excessive mucus in the lungs. A patient may even drown in his own secretions if sedatives are used too freely.

MEASLES

Definition.—Measles is an epidemic and very highly transmissible disease characterized by catarrhal symptoms, fever, and a characteristic eruption which appears on the fourth day of the disease.

Etiology.—The cause of measles is unknown. From experimental evidence it is known that the germs are in the secretions of the nose and throat and are also present in the blood. A patient is infectious from the beginning of symptoms which begin four days before the first appearance of the rash. A patient ceases to be infectious after the temperature falls and the rash begins to fade. There are no measles carriers. Once convalescence is established the patient is entirely free from infection.

Epidemiology.—Measles is probably the most widespread of all acute infectious diseases and more people suffer from it than from any other disease. It appears usually in outbreaks in large cities about every two or three years. In the country the interval between epidemics may be much longer; but, even in cities, there are few or no measles cases between epidemics. It spreads very rapidly and nearly all susceptible children who have been exposed contract the disease.

Efforts to control the disease have been rather futile. Placarding is useless for the reason that the disease is not usually recognized until the rash appears and the damage has been done, for the patient has already been infectious for about four days.

One attack of measles usually protects against a second attack, but second and even third attacks do sometimes occur.

There has been discovered a means of temporarily immunizing children against measles. It is done by the injection of convalescent human blood-serum. If the blood

of a person who has recently recovered from measles is withdrawn, the serum separated, and if this, after proper preparation, is injected into children who have been exposed to measles it will protect about 80 per cent. of them. It will modify the attack in nearly all of the remaining 20 per cent. The immunity, however, which is thus produced, is a passive immunity and lasts, usually, only a few weeks. To be successful the serum should be given in doses of at least 6 c.c. to children under four or five years of age and in larger doses to older children, and must be given within seven days from the first possible exposure to the infecting case. If given during the next three days of the incubation period it may modify the disease, but does not always entirely protect. It is given intramuscularly. Its greatest usefulness lies in the protection which can be afforded to children between the ages of six months and four years, a period during which most of the deaths from measles occur. It is not recommended that it be given to children over five or six years of age unless they are suffering from some chronic illness which an attack of measles might aggravate or cause to terminate fatally.

Mortality.—Measles is a very serious disease to child life. It kills as many children as does diphtheria, nearly as many as does whooping-cough, and several times as many as does scarlet fever. From 8000 to 10,000 children in the Registration Area of the United States die every year from measles. The fatality rate is highest in children over six months and under five years, and particularly under three years. The more or less general habit of exposing children to the disease when it is prevalent should be condemned.

Incubation Period.—The incubation period in measles is ten days from the time of exposure to the beginning of the catarrhal symptoms, and fourteen days to the time of the appearance of the eruption.

Symptoms and Signs.—The symptoms of measles conform more closely to the text-book picture than any of the other acute infectious diseases.

The Catarrhal Period.—The symptoms of the four-day invasive period begin gradually with conjuctivitis, cold in the head, cough, sneezing, and a gradual increasing temperature. On the second day, usually, sometimes on the third day of this period, if the inside of the cheeks are examined opposite the molar teeth, small, grayish-white spots will be seen. These are the so-called Koplik's spots by which it is possible to diagnose measles before the eruption. They begin to disappear as the rash comes out. The temperature during this period rises to 101° or 103° F., although it may be higher or lower.

The Eruptive Period.—On the fourth day red spots or macules appear along the hairline of the face and on either side of the nose. The rash spreads within twenty-four hours over the face and neck, by the next day it spreads to the body, and by the third or fourth day it is complete on the extremities. When completed it is a dusky red, mottled, and slightly elevated eruption. As the rash appears the child gets sicker, and the catarrhal symptoms become more intense, particularly the conjunctivitis and the cough. The temperature also tends to go up until the rash has been completed, but it falls very rapidly, frequently over night, once the eruption is fully developed. The constitutional symptoms and fever thus terminate by a crisis or a very rapid lysis. The rash fades out in three or four days, leaving some pigmentation in the skin, which is rapidly absorbed. There is no desquamation except a very fine scaling on the body, there being none on the hands and feet. The patient usually convalesces very rapidly.

Unusual Forms.—In babies, particularly, the disease may be very mild and often is difficult to diagnose. Very rarely the eruption may be absent, the disease being characterized only by catarrhal symptoms and fever.

Malignant measles is a term used to designate a severe form of the disease, associated with very high fever, delirium, and prostration. Hemorrhagic or black measles is a severe form of the disease attended with hemorrhages

from the nose, mouth, and the rectum or bleeding under the skin. In both these forms the fatality is very high.

Complications.—There is always a bronchitis with measles, for the eruption appears upon the mucous membranes as well as upon the skin surface, but ordinarily this clears up when the disease has finished its course or very soon thereafter. The most serious complication, however, is bronchopneumonia, which is the most common cause of death. Laryngitis frequently occurs during the acute process of the disease or it may occur during convalescence, at which time it may be so severe as to obstruct breathing and require intubation. Some of these laryngeal cases are due to laryngeal diphtheria which accompanies the measles. Otitis media occurs in about 16 per cent. of all cases. Pneumonia may come on at the height of the disease, although it frequently begins after the measles attack has apparently subsided. Conjunctivitis is common among convalescents. Noma, another complication, is a gangrenous process of the mouth, including the soft and hard tissues, which varies in intensity from mild destruction to extensive loss of tissue and is very fatal. It is most often seen among small children in institutional outbreaks. Pulmonary tuberculosis not infrequently follows an attack of measles. The measles simply lights up an old tuberculous infection that is already present in the lungs.

RUBELLA—GERMAN MEASLES

Definition.—Rubella is a fairly common disease of mild character, usually characterized by slight catarrhal symptoms, very slight fever, and a finely mottled eruption.

Etiology and Epidemiology.—The cause is unknown. The germs are generally believed to be in the secretions of the nose and throat. The patient is infectious from the beginning of the symptoms and continues so for a period of one to two weeks. There is reason to believe that occasionally patients may become carriers. Hospital isolation of a patient for one week is long enough. The disease is so mild that it is a hardship for adults, particularly, to be isolated longer than is necessary. As a matter of fact, since it is such a mild disease, and in view of the fact that most patients are over the infectious period even at the end of a week, one week's isolation is sufficient. One attack usually protects against a second attack. Rubella is difficult to distinguish from mild attacks of measles and scarlet fever. More adults have rubella, relatively speaking, than measles. The incubation period is from fourteen to eighteen days.

Symptoms and Signs.—The patient usually has the symptoms of an ordinary cold for a day or two, occasionally for a longer time, before the eruption appears, but usually he is first aware of being ill with an infectious disease when he sees the eruption on the body. It begins upon the face and spreads within twenty-four hours to the neck and upper part of the body, and it is almost always completed on the second day. It is a finely mottled eruption, but on the face it is more diffuse than in the case of measles. The eruption has disappeared usually within forty-eight to seventy-two hours from its beginning. There are two signs that are always very suggestive of the disease in addition to the eruption, and they are: pain or

stiffness in the back of the neck which is due to enlargement of the postcervical glands; and second, sore throat is quite common, but rarely severe. The only complications which are of any moment are bronchitis and very occasionally bronchopneumonia, which is rarely if ever fatal.

Treatment.—There is no specific treatment and, since it is such a mild disease, the patient does not need a great deal of attention. Rest in bed during the eruptive and temperature period and symptomatic treatment should be advised.

SMALLPOX—VARIOLA

Definition.—Smallpox is an acute, highly transmissible disease characterized by sudden onset with symptoms resembling influenza, and followed by an eruption which passes through the stages of papule, vesicle and pustule, and by fever and constitutional symptoms.

Etiology.—The cause of smallpox is unknown. The germs are in the secretions of the nose and throat, and are also present in lesions on the body. A patient is infectious from the beginning of symptoms, which is usually about three days before the appearance of any eruption. He continues to be infectious until all the crusts have been removed from the body, although a patient is most highly infectious during the acute period of the disease. Patients probably do not become carriers.

Epidemiology.—Smallpox is a very old disease, and while it has been in times past confused with certain other diseases, it has long been known. It is found in all parts of the world. It was one of the scourges of Europe and Asia in the days before vaccination. Almost everybody had smallpox then, and it was no respecter of persons. People of wealth and of aristocratic birth suffered equally with the poor. Faces pitted with smallpox were very common in those days. The number of deaths from it cannot be even estimated, but certainly smallpox and certain other infectious diseases helped to limit the growth of the population of Europe. It was a disease not only of adult life, but was even more common in children. It usually appears in epidemics.

The earliest attempts to prevent smallpox are shrouded in tradition, but for a very long time it was customary to remove the scabs from smallpox patients and to inoculate people because the inoculated disease was so much milder

than the natural disease. The purpose was to give children, particularly, smallpox early in life at a time when it is less severe and there is less danger of a fatal outcome. It is only recently that vaccination has made any great amount of headway in India, because the people who had been accustomed to practice smallpox inoculation did not believe that vaccination made them sick enough to protect against the disease. The wife of an English minister to Turkey tried to introduce inoculation of children with smallpox into England because she had seen it practised in Turkey.

In 1796 Jenner, an Englishman, performed the first human vaccination. His idea of vaccination was obtained from the observation that milkmaids scarcely ever had smallpox. Cowpox had been recognized for some time previously, and it was more or less commonly believed that milkmaids received their immunity through sores on their hands contracted from cowpox lesions on the udders of cows. Since that time all progressive countries have endeavored to keep their people vaccinated against this disease. It is not easy to do this even today because of public opposition. Many people have been led to believe that it is dangerous and that any illness which follows vaccination, even remotely, is due to it. It is customary in many parts of this country to require all children to be vaccinated when they enter school. This rule, however, is not faithfully observed except in large cities. There are many parts of the country where the population is very poorly protected against smallpox. In the northeastern part of the United States, the most densely populated, because of efficient health administration smallpox is a rare disease. The chief reason for this is that child vaccination is carried out very rigidly and the adult population which comes to us from foreign shores have to be vaccinated before they enter the country. Anywhere from 50,000 to 100,000 cases of smallpox occur in the United States every year, a very discreditable showing in comparison with several European countries.

Properly performed, vaccination is not a serious procedure in any sense of the word. The vaccinated arm is sometimes swollen to a considerable extent, but this subsides rapidly under rest and wet dressings. Rarely local infection and an abscess in the armpit may occur. The best time to vaccinate is in infancy. One vaccination may protect for life, but, generally speaking, its effect wears off as the person grows older. However, a person who has been, even in childhood, successfully vaccinated is sometimes protected for life, and a second vaccination results in *no take* or a very mild *take*. It is customary, however, in an outbreak to vaccinate all persons in immediate contact with smallpox patients, whether they have been previously vaccinated or not. In an epidemic it may be necessary to vaccinate the entire population. Whenever a nurse is called to care for a case of smallpox she should always be vaccinated, no matter how many times she has been vaccinated before.

Vaccination is performed usually on the outer aspect of the left arm. It is sometimes done on the leg to avoid an obvious scar, but this site is not recommended. The technique consists of cleaning the left arm on the outer aspect with some solution, either soap and water alone, acetone, or alcohol, and dropping upon the area a drop of the vaccine. A scratch or sometimes tiny superficial punctures in the skin are made through the drop of vaccine. If a person is immune at the time of vaccination a reddened area will appear within forty-eight hours, the so-called reaction of immunity, but it promptly disappears. If not immune the vaccination will begin to take in about four or five days, first appearing as a small vesicle which increases in size and is attended with redness and swelling. The whole process varies in different cases, but usually lasts from a few days to two weeks. A successful vaccination is one which produces as little local reaction as possible, but sufficient to protect the individual. The size of the scar is not an indication of the amount of immunity.

Mortality.—The ordinary mortality of smallpox is from 10 to 20 per cent., but as recently as 1926 it was 50 per cent. in Los Angeles. About thirty years ago the disease became much milder in the United States, and this mild type has spread to some extent into South America, Europe, and other countries. It is not uncommon to read of epidemics of several hundreds of cases with not even a single death. Recently, however, a severe form of the disease has appeared in several outbreaks in certain cities in the United States, and it may not be long before the old serious form of the disease will return generally. Neglect of vaccination will be serious to the country if this should happen.

Immunity.—One attack protects against a second attack except in rare instances.

Incubation Period.—The incubation period is from twelve to fourteen days.

Symptoms and Signs.—The early symptoms of smallpox are usually confused with those of influenza or grip. They are headache, backache, sudden high temperature, prostration, and often vomiting. These symptoms subside within the next two or three days. Then the rash begins to appear on the face, the forearms and wrists, from which it spreads rapidly over the whole body. It is first papular in character and can be felt as pieces of shot in the skin. In about three days the papules change to vesicles. A typical vesicle is perfectly hemispherical and the interior is subdivided much like an orange. It is characteristic in appearance. About three days later these vesicles change to pustules and the pustules later dry up, forming either brown crusts or sometimes yellow crusts. The lesions almost always appear on the soles of the feet and on the palms of the hands, and when they dry up they change to perfectly round mahogany-colored patches beneath the thick outer layer of skin.

The temperature rises rapidly early in the disease, but usually falls to normal at the time the eruption appears. In well-marked attacks it goes up again with the onset

of the pustular stage of the disease and is of a septic character.

The face often swells to considerable extent, sometimes sufficient to even prevent recognition. The superficial tissues of the other parts of the body also swell. The lesions not only appear on the skin but also in the mouth, throat, larynx, and sometimes in the gastro-intestinal tract.

The acute process of a well-marked attack of smallpox lasts three or four weeks. It takes from four to six weeks for the crusts on the body to shed. The more superficial lesions leave only a reddish-brown staining which disappears in a few weeks. Whatever lesions are deep in the skin, in addition to temporary pigmentation, leave small pits. These are most often seen on the face.

During the eruptive period certain noteworthy symptoms are present. As the lesions fill up they become tender and during the late vesicular and early pustular stages they are often very painful. During the pustular stage a disagreeable musty odor is noted sometimes. During the crusting stage itching is a troublesome symptom. Patients are often very constipated.

Types of the Disease.—Patients may die early in the disease from overwhelming toxemia, or later during the pustular stage from toxemia and septic infection.

There are four well-recognized forms of the disease:

(1) Discrete smallpox, characterized by mild symptoms and few lesions.

(2) Ordinary.

(3) Confluent, where the vesicles coalesce and characterized by severe symptoms and a very intense eruption.

(4) Hemorrhagic, a very fatal type, particularly characterized by a diffuse hemorrhagic rash without any vesicles and bleeding from the mouth, nose, rectum, etc.

Complications.—Lesions in and about the eyes cause conjunctivitis and may result in destruction of vision. Abscesses of the skin during convalescence are very common. Obstruction to breathing because of involvement of

the larynx may occur, and bronchopneumonia is not uncommon. General sepsis in severe cases is quite common.

Treatment.—There is no specific treatment for smallpox. Occasionally persons who have been vaccinated successfully may, in later years, contract smallpox, but in such cases the disease almost always runs a mild course. Such an attack is called varioloid. Rest in bed during the acute period, warm baths for high temperature and delirium, plenty of fluids, and other symptomatic treatment is required for the early symptoms. During the early pustular stage it may be necessary to employ some drug for the pain. During the crusting stage the most valuable procedure is the daily baths. They make the patient more comfortable, help to keep the skin clean, prevent secondary infection, and relieve the itching. Boric acid ointment applied to the skin is also very useful during the crusting stage.

CHICKENPOX—VARICELLA

Definition.—Chickenpox is an acute, mild, highly transmissible disease, characterized by a vesicular eruption which appears usually in crops, and by more or less temperature and catarrhal symptoms.

Etiology and Epidemiology.—The etiology of chickenpox is unknown. The virus is in the secretions of the mouth and throat and the lesions of the skin. A patient is infectious for a day or two, at least, before the eruption appears, but is most highly infectious during the first few days of the disease. The crusting stage is only slightly infectious, but patients are usually isolated until the crusts have disappeared. Patients probably do not become carriers. Overlooked cases with only a few spots are quite common.

Chickenpox is a very common disease and a very large percentage of the population contract it during childhood. It is not, however, uncommon in adult life, at which time the symptoms are usually more severe than in children. One attack prevents a second attack almost always. Chickenpox is important because of its resemblance to smallpox, although there is almost no mortality from chickenpox itself. Many outbreaks of smallpox have been allowed to get under way because physicians insisted that the early cases were chickenpox and not smallpox. The disease can usually be prevented by the inoculation of a child exposed to chickenpox with serum taken from someone recently recovered from the disease, when given early enough. This procedure is useful in institutions for children to prevent outbreaks.

Incubation Period.—The incubation period of chickenpox is between two and three weeks, usually about sixteen days.

Symptoms and Signs.—Usually the first symptom is small vesicles which appear upon the body, on the back or abdomen, and later upon the face. They are not perfectly round as in smallpox, and are generally smaller, irregular in outline, and collapse when opened. These first vesicles rapidly dry up and new ones appear daily for three or four days, sometimes over a longer period. The vesicles begin as papules and a few do not get beyond that stage. The eruption is often quite itchy. As the eruption increases the patient begins to show symptoms of redness of the eyes, cold in the head, cough, and the temperature begins to rise. In other words, the temperature, the catarrhal symptoms, and other symptoms increase and decrease with the appearance and subsidence of the lesions in the skin. In this respect it differs very much from smallpox, in which the patient is sick for three days before the eruption appears. The vesicles are sometimes found on the roof of the mouth and in the throat. The disease lasts for a week or ten days, but a period of two or three weeks usually elapses before the crusts have been shed.

Complications.—Usually there is staining of the skin which is more or less persistent after the crusts have disappeared. There is little pitting, although most people who have had chickenpox show one or more pits, particularly on the cheeks and forehead. Bronchopneumonia is rare, although it does occur, while bronchitis is not uncommon. Abscesses frequently arise from the lesions of the skin. Conjunctivitis is quite common during the acute period of the disease, may persist into convalescence, and may usher in an attack of phlyctenular or interstitial keratitis.

Treatment.—Rest in bed during the acute process of the disease, some mild ointment, such as boric acid ointment, applied to the lesions helps to make them more comfortable. Daily baths during the convalescence, as in smallpox, contributes to the comfort of the patient and hastens the disappearance of the crusts.

MUMPS—IDIOPATHIC PAROTITIS

Definition.—Mumps is a very common acute disease characterized by swelling of the face, either on one or both sides, attended with a fever and running a course of about ten days.

Etiology and Epidemiology.—The cause of the disease is unknown. Mumps is widely distributed and it is a disease from which almost every one suffers sooner or later. The germs are believed to be in the secretions of the nose and throat. The patient is infectious from the beginning of symptoms and continues to be infectious from ten days to two weeks. Sometimes patients become carriers. It is a disease of childhood usually, although it is quite common in adult life. During the World War there were over 200,000 cases of mumps among the United States troops. Usually no effort is made by the health authorities to control this disease in civil life because it is very rarely a cause of death.

Incubation Period.—The incubation period is from two to three weeks.

Symptoms and Signs.—Swelling of the salivary glands is the most noticeable feature of mumps. The first sign of the disease almost always is a swelling in front of and just below the lobe of the ear, about the angle of the jaw. This swelling is chiefly due to enlargement of the parotid gland. Less frequently the submaxillary and sublingual glands are involved. This swelling increases over a period of four or five days and reaches considerable size. A few days after the swelling begins on one side it may start on the other side of the face, although this swelling may be less. Sometimes it may be confined to one side only.

This swelling is painful and is sensitive to touch. The patient has difficulty, usually, in opening the jaw wide

enough to eat. As the swelling increases the temperature begins to rise and reaches 101° or 102° F., or even more, and subsides with the subsidence of the swelling in the face. Often there is very little prostration and it is difficult to keep a child in bed. Prostration in adults, however, is usually more marked, and often they are glad to go to bed. The disease lasts ordinarily from ten days to two weeks.

Complications.—The most common is orchitis in the male. This swelling usually follows the swelling in the face and comes on during convalescence. It may affect one or both sides. Female patients may have pain in the lower abdomen due apparently to some involvement of the ovaries. Rarely the breasts may be swollen and tender. Occasionally a patient may have pain in the epigastrium attended with tenderness and vomiting, and due to the involvement of the pancreas. Meningitic symptoms may be present without actual meningitis. Patients who have mumps may not feel very ill during the course of the disease, but convalescence may be prolonged, so that some time is required before they feel normal again. This is particularly true of adults.

Treatment.—There is no specific treatment. The patient should be put to bed during the febrile period of the disease. Plenty of fluids should be given. During the height of the disease the patient may not be able to take solid food because of the spasm of the jaw, and liquid diet will have to be resorted to. Either heat or cold in the form of a hot-water bag or an ice-bag should be applied to the face, whichever is most agreeable. Heat is usually more acceptable than cold. Patients are discharged from the hospital in about two weeks or as soon as the swelling and tenderness in the face and neck has disappeared.

INFLUENZA

Definition.—Influenza is an acute highly transmissible disease characterized by sudden onset with fever, headache, severe pains in the back and extremities, and attended and followed by an amount of prostration out of proportion to the apparent severity of the illness.

Etiology and Epidemiology.—The cause of this disease is unknown. The germs are in the secretions of the nose and throat. A patient is infectious from the onset of symptoms and during the acute process. There are carriers, both healthy and convalescent, which are responsible for almost yearly outbreaks. While some cases occur every year, particularly in the colder months, the most noticeable feature of the disease is its appearance in epidemics and pandemics. There have been recorded some fourteen or fifteen pandemics since 1510 A. D. In the last pandemic of 1918 it is estimated that there were more than 200,000,000 cases and 10,000,000 deaths, of which about 5,000,000 took place in India alone.

Epidemics of influenza will spread over the world in a few months, and will sweep through a single country in a month or six weeks. In general, about 30 per cent. of the population fall victims of the disease during an epidemic. The rapidity of dissemination is partly explained by the very short incubation period of twenty-four to twenty-eight hours, and partly by the general susceptibility to the disease. The fatality rate is from 2 to 4 per cent., and in hopsitals, which receive the worst cases, it may reach 10 to 15 per cent.

Symptoms and Signs.—During an epidemic recognition of influenza is comparatively easy and fairly accurate, but during interepidemic periods an exact diagnosis is very difficult, because there are other acute diseases which resemble it very closely. There is no laboratory test by

which it can be definitely diagnosed. There are all gradations of the disease, from a mild catarrhal attack, involving the upper respiratory passages, with little or no temperature, to cases which are suddenly stricken with overwhelming infection and from which they die very promptly. The symptoms which particularly characterize influenza are its sudden onset with fever, severe headache, backache, and severe pain in the extremities and prostration. It is usually attended by catarrhal symptoms, but often these are quite mild. The toxemia of the disease produces great depression upon the circulation. The convalescent prostration may last weeks or even months. The diagnosis must rest at present upon the usual clinical picture, a low white blood-cell count, and exclusion of other diseases which may produce a similar set of symptoms.

Complications.—The most serious and most common complication is pneumonia. Other complications are vomiting, diarrhea, jaundice, protracted bronchitis, and rarely tuberculosis.

Treatment.—There is no specific treatment. In the early stages drugs should be given to relieve the pains. Fluids should be given freely and supportive treatment employed. The most important advice is rest in bed during the disease, no matter how trivial, and insistence upon a very slow convalescence.

LOBAR PNEUMONIA

Definition.—Lobar pneumonia is a disease characterized by the consolidation of one or more lobes of the lungs, bloody sputum, shortness of breath, and pain in the chest.

Etiology and Epidemiology.—The cause of this disease is the pneumococcus, a small diplobacillus found in the sputum, which can usually be recognized under the microscope by its form and staining qualities. The germs present slight variations and have been divided into four groups—I, II, III, IV. The first three are special types of the organism and they can be distinguished by laboratory methods, while the fourth group includes all types not classified in the other three groups. It is important to determine to which group the germ in any given case belongs, for there is a serum treatment for Type I which is quite efficient. Furthermore, determining the type of germ helps to forecast the outcome of the disease. Anti-pneumococcus serum for Type I pneumonia is made by the repeated injections of horses with the pneumococcus, and when the horses' serum shows sufficient antitoxic value they are bled and the serum is put up in vials containing about 100 c.c.

Pneumonia is one of the most prevalent of all the infectious diseases and has a consistently high death rate. It is more serious in adults than in children, and the fatality rate in old people is highest of all. It is much the most serious of all the acute infectious diseases in the colder climates. Type I serum has saved many lives, otherwise little has been done in recent years to reduce the fatality rate. Nothing has been achieved in the prevention of the disease. Quite recently in Pittsburgh and Los Angeles pneumonia has been classified as a reportable disease and homes are placarded as in the case of scarlet fever and diphtheria. Whether this will result in any reduction of

the disease or not no effort should be spared to find measures to lessen the havoc wrought by pneumonia.

The germs escape from the body in the sputum and secretions of the nose and throat. A patient is particularly infectious during the acute process from the beginning of symptoms, and a certain percentage of convalescents become carriers for weeks and months. The disease may arise from exposure to a frank case of pneumonia, but more likely its source is some upper respiratory infection due to the pneumococcus, or to some carrier. Carriers

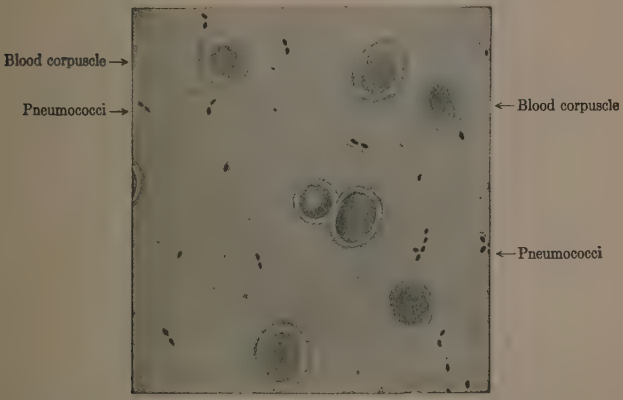

Fig. 2.—Capsulated pneumococci in blood from the heart of a rabbit; ×1000 (McFarland).

keep the disease alive from year to year, and while lobar pneumonia may occur during the warm months it is much more common during the winter months. The most reasonable explanation for this is that exposure to cold irritates mucous membranes and chills the body, paving the way for disease if a person has the pneumococcus in the nose or throat at the time. Interchange of germs is also much more likely during cold weather because people stay indoors and come into closer contact than during the summer months. The disease is transmitted by direct and

indirect contact and by exposure to violent coughing at short range. Kissing and introduction of the germs on fingers into the mouth constitute the most common methods of infection. Other predisposing causes are alcoholism, other acute infectious diseases, chronic diseases, fatigue, exposure to gases or other irritating substances, and, most important of all, the common cold. Neglected colds which may be caused by the pneumococcus, or by some other germs, in persons who are harboring the pneumococcus frequently lead to lobar pneumonia.

One attack of the disease does not usually confer permanent immunity against second or third attacks. In fact, the lungs are subsequently more vulnerable to bronchitis and pneumonia. That one attack protects against subsequent attacks of lobar pneumonia to some extent is nevertheless undeniable. Supporting this is the fact that lobar pneumonia may spread more rapidly among certain races or localities where the disease is uncommon, indicating that in regions where it is constantly present many people must receive immunity either by a pneumonia attack or an upper respiratory infection caused by the pneumococcus, but without lung involvement.

Symptoms and Signs.—The usual initial symptoms are chill, fever, pain in the side, and cough and rusty sputum. The temperature usually is high and sustained throughout the course, which is from seven to ten days' duration. Rapid breathing, cyanosis, and pain on respiration are present. The pain in breathing is very distressing and is due to attendant pleurisy. As the disease progresses the patient becomes prostrated and there is danger of collapse.

The signs of pneumonia can usually be found on physical examination of the chest within three days of the onset. Occasionally they may not appear until late in the disease. The amount of lung involvement can also be demonstrated by the *x*-ray. The lung tissue becomes solid and would sink if put in water. It is because of this solidity that signs can be detected on examination. If the disease

terminates favorably it usually ends by a crisis, and the patient may awake from a sleep feeling quite well. The lung tissue may still be quite solid and several days may pass before the exudate is absorbed.

Complications.—The most common complications are pleurisy, empyema, abscess, or gangrene of the lung. Others are endocarditis, meningitis, and tuberculosis as a sequel.

Treatment.—A serum, the antipneumococcus serum, is used for Type I infection. It is first necessary to collect the sputum, inject it into a mouse, and examine the mouse, which will die within twenty-four hours, to determine the kind of germ which is responsible for the attack. The serum is usually given intravenously in 100 c.c. doses and repeated if necessary. It may either ameliorate the symptoms or precipitate an early crisis. Uncomfortable reactions may take place very soon after the administration of the serum, but they are rarely serious. Serum rashes in the second week are very common.

The patient, if an adult, should be given plenty of fresh air with the windows open, except when the temperature is very low. There is nothing to be gained by freezing the nurse or the patient himself, but cold fresh air is stimulating. The patient should be kept warm and the temperature in the room bearable for the nurse.

Fluids should be given freely and this should be the diet during the acute process, including much milk, cocoa, egg-nogs, and other liquids containing some food value. It is a disease of short duration and nourishment is not so important in its treatment.

The dyspnea, cough, and pain are very troublesome and may be somewhat relieved by frequent changes in position or by a close-fitting binder. The patient should not be allowed to sit up or go to the bathroom during the acute process or during early convalescence because of the danger to the enfeebled circulation. Care of the mouth, alcohol rubs or warm sponges for very high temperatures and delirium, and other good nursing procedures contribute much to the comfort of the patient and the chances of recovery.

ERYSIPELAS

Definition.—Erysipelas is an acute disease characterized by redness and swelling of the skin and inflammation of the subcutaneous tissues which spreads widely from the point of infection, and by a septic-like temperature.

Etiology and Epidemiology.—The cause of the disease is the streptococcus. Whether one variety of this organism is responsible for the disease is not known, but probably it is caused by more than one strain.

Infection usually takes place through the nose, but it is frequently introduced into any kind of accidental or operative wound. It is more frequent in elderly people, although no age is exempt, and in those in poor physical condition.

The germs reside in the nose and throat for varying periods of time in the sick and in well persons, and the secretions of the nose and throat are the medium of infection. The disease is more serious in the aged and in very young children.

Symptoms and Signs.—The most common form of the disease is facial erysipelas, which begins on the bridge of the nose. Infection takes place through the vestibule of the nose from a small furuncle or ulcer. Almost all cases give a history of previous rhinitis or a local infection inside the nose. It usually spreads from this point over both sides of the face, over the forehead and ears and into the scalp, until the process on both sides meets on the back of the head. Rarely it may extend down the neck to the body, over which it may spread quite extensively. The face is red and swollen and the eyes may be partially or completely closed. The disease not infrequently begins at other points about the face or ears, infection taking place through some abrasion.

The disease may start on any part of the surface of the body from an infected surgical or accidental wound which itself may be very trivial. The extension of the disease on the body is less limited than when it begins on the face, and it may spread over the entire body. Erysipelas of the body is a very serious disease.

The temperature in erysipelas is of a septic type which continues as long as the disease is extending. Chills are not uncommon. Patients die of toxemia and sometimes of septicemia.

Treatment.—There is no treatment which will prevent the spread of the disease. It is only limited by the severity of the infection and the anatomical character of the subcutaneous tissues. During recent years serum taken from persons recently recovered from erysipelas has been used with some success. That it is not more successful is due to the fact that more than one strain of the streptococcus is probably responsible for the disease. There is also on the market an artificial erysipelas serum, but it is probably of less value than convalescent human serum.

The most useful local applications are ice-cold compresses frequently changed. If these cannot be used, ichthyol ointment is useful, although it is unpleasant because of its color. Many other kinds of applications also are used. Plenty of fluids and good general nursing care are important factors in a successful outcome.

TYPHOID FEVER

Definition.—Typhoid fever is an acute disease characterized by continued fever, abdominal symptoms, diarrhea, enlarged spleen, and a low-grade delirium.

Etiology and Epidemiology.—The cause of the disease is the *Bacillus typhosus*. The germs escape from the body principally in the stools, but sometimes in the urine. A patient is infectious from the beginning of symptoms and during the entire acute period of the disease, and a certain percentage of patients may be carriers for months and even many years afterward. Patients should be isolated during the acute period and not released until at least two cultures of the stools are negative for typhoid bacilli.

The disease appears sporadically and in epidemics. Sporadic cases usually receive their infection from contact with an active case or a carrier. Epidemics are due either to infected water, milk, or are caused by a carrier who infects food or drink. Drinking water is polluted by the germs in the stools of typhoid patients which have not been properly disposed of. Milk outbreaks are due to contamination of the milk by a person sick with typhoid fever, or one who is a carrier, and who handles milk either in the barn or in a dairy. Typhoid fever is also transmitted by cream, ice-cream, oysters and other shell-fish, and unwashed green vegetables that have been fertilized by night soil or washed in polluted water. Flies are a menace because they may transfer germs from unscreened privies to kitchens and mechanically infect food. Contact infection may also take place, both direct and indirect. Nurses in hospitals frequently contracted typhoid fever from patients until typhoid vaccination was generally introduced.

Typhoid fever was formerly very common and the number of deaths from it was very large. It has been a scourge

in all wars except the World War. Cases were present in large communities throughout the year, but were far more prevalent during the summer and early fall. There have been very many large scattered outbreaks from water pollution and smaller ones from milk, oysters, etc. But typhoid fever is fast vanishing. In parts of the country where the water supply is made safe for drinking purposes, where sewage is properly treated, where the milk supply is carefully supervised and the milk pasteurized, and where food infection is prevented by proper regulations and supervision of carriers, typhoid fever is a rare disease. On the

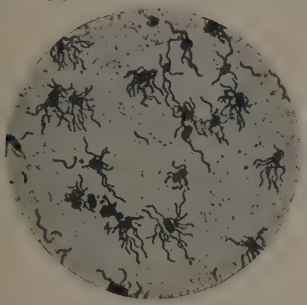

Fig. 3.—Typhoid bacillus (Fränkel and Pfeiffer).

other hand, in parts of the United States where these things are not well done or not done at all, typhoid fever is still present. The one most important factor in the prevention of typhoid fever is the introduction of safe drinking-water and the disposal of sewage so that it will not contaminate water supplies.

Typhoid vaccine is also a very useful preventive. For persons living in cities and towns with safe drinking water, etc., it is less necessary; but for campers, soldiers on active duty, travelers to parts of the world where typhoid fever is still common, for family and other contacts with the disease, it is a most useful protective. It is a suspension of dead typhoid germs and the strength of each dose is measured by the number of germs present.

Three doses are given subcutaneously, each about one week apart. Slight local reactions and sometimes fever and constitutional symptoms follow the injection, but they are never serious. The immunity produced lasts one to two years. One attack of typhoid fever usually confers protection against subsequent attacks.

Incubation Period.—This is variable, but usually it is from one to three weeks.

Symptoms and Signs.—The symptoms come on slowly. A tired feeling, loss of appetite, gradually increasing headache, nosebleed, and diarrhea are the most common early symptoms. The temperature goes up gradually, showing an evening rise and morning fall which continues during the entire course of the disease which lasts three or four weeks. During the height of the disease the patient suffers from a low-grade delirium and other nervous symptoms. The tongue is heavily coated, the mouth dry, and there is sordes about the teeth. The spleen is enlarged and the abdomen distended. The bowels are usually loose, although they sometimes may be constipated. Pain in and particularly tenderness of the abdomen are frequent, and the distention is often distressing. Gradually the symptoms subside, leaving the patient very thin and prostrated. One of the noticeable features of convalescence is the intense appetite and rapid recovery of lost weight.

Diagnosis.—Typhoid fever is not always easy to recognize from some forms of tuberculosis, and other diseases, characterized by continued fever, resemble it. The diagnosis can be verified by finding the germs in the blood and in the stools, and also by the results of the Widal test. The germs can be found in the blood very early in the disease, while the Widal test does not become positive for eight to ten days. The Widal test consists of mixing a small amount of the patient's blood-serum with known typhoid germs and observing the effect of the serum upon the germs. This is done in a hanging-drop under the microscope. The germs are motile and if after a short time they become clumped and still it denotes a positive test.

Complications.—The most serious complications are hemorrhage from the intestinal ulcers which are a part of the pathology of the disease, and perforation of these ulcers which causes general peritonitis. Other complications are pneumonia, inflammation of the gall-bladder, multiple skin abscesses, acute osteomyelitis of some bone, and thrombosis of veins.

Treatment.—There is no specific treatment for typhoid fever. It is a self-limited disease which runs its course of three to five weeks, depending upon the severity.

Very much, however, can be done to insure a favorable outcome, and to add to the patient's comfort. The patient should be confined to bed, and the earlier the patient goes to bed, the less serious will be the attack. The diet is important. Formerly liquid diet alone was employed for fear of exciting an intestinal hemorrhage or precipitating a perforation. On the other hand, typhoid fever is rather a protracted and exhausting disease, and it is important to supply as much nourishment as possible throughout its duration. It has been found that solid food, if selected and given in proper amounts, does not predispose to hemorrhage and perforation of intestines. Early in the disease the appetite is poor and at this stage free use of fluids only, particularly water, should be made. After a few days or a week some solid food may be added. There are several typhoid diets in use. The idea of all of them is to provide as nourishing and palatable a diet as possible, and one in which the amount of residue is not large. When hemorrhage or a perforation threatens or occurs, it is necessary to omit solid food at once. On a substantial diet the patient is more likely to survive, will be more comfortable and far less emaciated when convalescence is reached.

For the high temperature and nervous symptoms baths are of great use. The cold tub-bath every three to four hours for a temperature of 102.2° F. was formerly in great favor, and when carried out properly is probably the best type of bath. It is rather harsh and many patients object

to it, for the temperature of the bath-water is 65° F. if the strict Brand treatment is followed. It also requires much lifting to move the patient to and from the tub. So that at the present time sponge baths at 70° to 85° F. given in bed are the most popular. The bath not only reduces the temperature, but is very stimulating to a patient who is usually in a state of low delirium. It promotes rest and vivifies physiological processes.

For abdominal distention it is necessary to change the diet. It may be relieved by turpentine stupes and low enemas. Enemas should be administered with care and never given high because of the danger of causing hemorrhage and perforation. Diarrhea may be troublesome and the most important procedure is to cut down or change the diet. For hemorrhage absolute quiet and starvation are necessary. When perforation occurs food by mouth should be stopped and operation offers the only hope of recovery.

Keeping the mouth clean, administration of fluids freely, and other nursing procedures contribute much to recovery from this long and exhausting disease.

Paratyphoid Fever.—For practical purposes this is a mild form of typhoid fever and caused by the paratyphoid bacillus, a close relative of the typhoid bacillus.

BACILLARY DYSENTERY

Definition.—Bacillary dysentery is an acute disease characterized by diarrhea accompanied with tenesmus, mucus and blood in the stools, fever, and collapse in severe cases.

Etiology and Epidemiology.—The cause of the disease is the *Bacillus dysenteriæ*, of which there are four well-known strains, Shiga, Flexner, Strong, and Y. The germs escape from the body in the stools and find their way into the bodies of the well through the mouth by contact and through infected water and milk.

Dysentery is much more common in tropical than temperate climates. It commonly appears in epidemics attended with high fatality rate. Both adults and children are susceptible, particularly where they are crowded into camps and institutions, also in hospitals for the insane which are provided with poor sanitary arrangements. It is frequent among soldiers in war time. In temperate climates it is usually more common in small children. A portion of the summer diarrhea among babies is due to this organism.

Prevention depends upon the proper disposal of the stools and the protection of water and milk supplies, particularly the latter, and screening against flies both the sick and the well. Preventive vaccines have been used, but the result of their use has not been established.

Treatment.—There is no specific remedy for the disease. Fluids should be given in large amounts, preferably by the subcutaneous and intravenous routes, to replace fluids lost by diarrhea. No solid food should be given and supportive treatment to prevent collapse should be administered.

AMEBIC DYSENTERY

Definition.—Amebic dysentery is an intestinal disease characterized by an ulceromembranous inflammation, and by abdominal pain, tenesmus, mucous and bloody stools, and emaciation.

Etiology and Epidemiology.—The cause of the disease is the *Entamœba histolytica*, a microscopic parasite. These parasites can be found in the stools of the patient and in the pus from the liver abscess. A patient is infectious as long as they can be found in the stools. Carriers are frequent.

The disease is most common in tropical climates, but is fairly common in temperate zones, and has even been found in arctic regions. It is spread by contact. Prevention of the disease consists in the search for carriers, mild and chronic cases. These should be treated with colonic irrigations of quinin and other solutions which kill the parasite in the encysted stage. It is not a water-and-milk-borne disease. It is contracted, directly or indirectly, from infected persons.

Symptoms and Signs.—The symptoms of the acute form of the disease are pain, tenesmus, mucous and bloody stools, and the passage of intestinal sloughs. Most cases recover, although some may die of exhaustion or perforation of the intestines, which causes peritonitis.

A certain percentage of cases become chronic, and may last for months or even years, with intervals of freedom from symptoms. The most common complication is abscess of the liver, which usually breaks through into the right lung, although it may first point into other organs near the liver.

Treatment of the acute stage consists of rest in bed, liquid diet, and the administration of emetin, which is almost specific for this stage. The chronic stage is treated by colonic irrigations of quinin and other solutions, and by proper dieting. Liver abscesses should be evacuated.

CHOLERA

Definition.—Cholera is an acute disease, characterized by severe diarrhea, abdominal cramps, vomiting, dehydration, and collapse.

Etiology and Epidemiology.—The cause of the disease is the *comma bacillus*, which is found in the feces.

Cholera is a contact and water-borne disease and the germs enter the body through the mouth. The bacilli

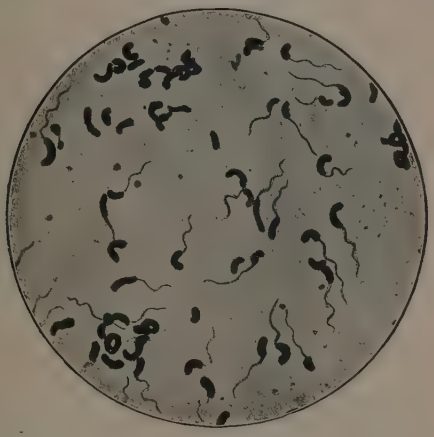

Fig. 4.—Cholera spirilla, showing flagella.

escape from the body in the stools. A patient is infectious from the beginning of the attack and for about two weeks afterward. A certain percentage of convalescents become carriers. Healthy carriers, also, are more or less common.

Cholera usually appears in epidemics and is one of the most feared of human diseases, for the suffering is great and the fatality rate is very high. Large outbreaks are usually water borne, occasionally they are milk borne.

In cholera centers the disease appears sporadically, and these isolated cases receive their infection from carriers.

Control.—The control of this disease depends upon providing safe drinking-water and milk, sanitary disposal of excreta, and the detection of carriers.

The immunity conferred by an attack of the disease is of short duration. During an epidemic vaccines made from the cholera germs are used to prevent the spread of the disease. The vaccine immunity lasts about one year.

EPIDEMIC CEREBROSPINAL MENINGITIS—CEREBROSPINAL FEVER

Definition.—Epidemic cerebrospinal meningitis is an acute disease characterized by fever, headache, stiffness in the neck, pain in the back, and other signs indicating an inflammation of the meninges or coverings of the brain and spinal cord.

Etiology and Epidemiology.—The cause of the disease is the *Diplococcus intracellularis meningitidis*, commonly called the *meningococcus*. These germs are found in the cloudy spinal fluid obtained by lumbar puncture. They are usually found inside the pus-cells in this fluid. They also may be sometimes recovered by swabbing the nasopharynx and planting them on a special medium. The germs escape from the body in the secretions of the nose and throat. A patient is infectious from the beginning of symptoms and throughout the acute process. A certain percentage of convalescents continue, for varying periods of time, to be nasopharyngeal carriers. Healthy carriers also are not uncommon.

Sporadic cases of the disease usually receive their infection from carriers, but during an epidemic mild unrecognized cases as well as carriers are important factors in its dissemination. It is endemic in many parts of the world. At times, however, it becomes epidemic and causes many deaths, for the fatality rate is from 40 to 50 per cent. even when patients are given the antimeningitis serum, and about 80 per cent. among those who do not receive it.

Antimeningitis serum is obtained from horses which have been inoculated with several strains of meningococcus. It is put up in doses of about 20 c.c. in syringes or bottles.

Patients should not be discharged until convalescence is well established and at least two swabbings of the naso-

pharynx fail to show meningococci. Suspected carriers are also detected in the same manner.

Incubation Period.—The incubation period is usually short—from one to five days.

Symptoms and Signs.—*Typical Cases.*—The illness is usually ushered in with severe headache and vomiting, and in small children with a convulsion. Subsequently there is pain and stiffness in the back of the neck, retraction of the head and arching of the back, while normal extension of the legs becomes painful. Patients are irritable in the early stages, but retain normal mentality. Later they become stuporous and fall into coma. The temperature is of a septic character throughout the acute process, which lasts two or three weeks. In a small percentage of cases a hemorrhagic spotted eruption appears on the body, while catarrhal symptoms and herpes are common. Relapses of the disease are not uncommon. The final diagnosis is made by finding meningococci in the spinal fluid.

Atypical Cases.—The germs do not always attack the meninges. The disease may take the form of a septicemia, which is usually a serious one and ends fatally. This type of the disease is very often accompanied by a hemorrhagic eruption. Particularly during an outbreak the only manifestation of the disease may be catarrhal symptoms of the nose and throat, with or without fever. This type is not often recognized, but is much more common than generally believed.

Complications and Sequelæ.—Not only is this a disease serious to life, but it sometimes is followed by permanent impairment of the patient. Hydrocephalus is quite common, particularly in babies. Deafness, blindness, and paralyses may ensue occasionally because of the damage to nerves as they branch from the brain and spinal cord. Bronchopneumonia is quite a frequent complication. Sudden death during the disease sometimes occurs without warning.

Treatment.—Successful treatment depends upon the early administration of antimeningitis serum. This is

usually given intraspinously, although it is sometimes given intramuscularly and intravenously. It is given once or twice a day in the early stages of the disease and less frequently during the later stages. Lumbar puncture with removal of excess spinal fluid helps to relieve coma and other nervous symptoms.

The *nursing care* is important. Patients should be kept very quiet and protected from noise, for they are very irritable. Being a disease of considerable duration, as much nourishment and fluids should be given as possible without upsetting digestion. Pain on movement is often exquisite, and patients should be made as comfortable as possible.

ACUTE EPIDEMIC POLIOMYELITIS—INFANTILE PARALYSIS

Definition.—Acute epidemic poliomyelitis is an acute disease characterized by sudden onset with fever and followed, usually, on the second or third day by paralyses.

Etiology and Epidemiology.—The cause of the disease is unknown. The germs are in the brain and cord tissues, and are also in the secretions of the nose and throat, from which they can be recovered by swabbing or washings of the nasopharynx. These facts have been ascertained despite the lack of knowledge of the exact cause of the disease, because monkeys are very susceptible to experimental inoculation. If the brain or cord tissue of a fatal case in man or the monkey, or washings from the nasopharynx of the sick, or carriers, are injected into the brain of healthy monkeys which have never had acute poliomyelitis, they will, within twenty-four or forty-eight hours, develop acute symptoms and paralysis. A great deal of investigation of this disease has been carried out, but the exact germ has not been recovered. It is a filtrable virus. By "filtrable virus" is meant one so small that it goes through the finest laboratory filter, such filters as will strain out ordinary bacteria.

A patient is infectious from the beginning of the symptoms and is infectious during the acute period of the disease. It has been agreed upon by State Boards of Health that three weeks shall be the isolation period. At the end of this time a certain number of patients are still carriers and they may continue to be carriers for weeks or even months. These carriers can be detected by inoculating into monkeys material washed out of the nasopharynx of the convalescent patients.

Acute epidemic poliomyelitis is constantly present in many countries and has been known for a long time, but

during the last fifty years it has appeared in serious epidemics at different times and in different parts of the world. There have been several epidemics in the United States, the one in 1916 being the most serious. It is attended with a fatality rate of something like 10 per cent.

The incubation period is not exactly known, but it is probably variable, from seven to eighteen days. Epidemic poliomyelitis is almost wholly a disease of childhood, although adults may contract it, particularly during epidemics.

Symptoms and Signs.—*Typical Cases.*—The patient is taken suddenly ill with fever, sometimes vomiting and occasionally with convulsions, and on the second or third day these symptoms are followed by paralyses. The paralysis may, however, be delayed even as long as a week, the delayed paralysis occurring more frequently in older children and adults. Any group of muscles in the body may be paralyzed, or it may be extensive enough to render the patient helpless. The paralysis is caused by the damage inflicted on the nerve centers of the spinal cord and brain from which the motor nerves arise. The amount and extent of the paralysis depend upon the number and situation of the nerve centers damaged or destroyed. The most common paralysis is partial loss of power in one leg. Partial paralysis of one arm is frequent. Then follows in frequency both legs, an arm and a leg, or both arms. All four extremities may be paralyzed. The muscles of the back and abdomen and of the face and eyes may be affected. The fatal cases are those in which the vital centers which control breathing, swallowing, and the circulation are involved. These centers may be the only ones affected and almost all such cases die.

Atypical Cases.—Like other acute infectious diseases there are abnormal forms of this disease. The first sign and perhaps the only sign of the disease will be a paralysis of one group of muscles or even a single muscle, which may be overlooked unless carefully searched for. Such limited paralysis may also be very transient. On the other hand,

there may be no paralysis whatever, the disease manifesting itself only by fever and catarrhal symptoms of the upper air passages.

Treatment.—During the acute period the patient should be kept perfectly still and the extremities involved should be kept warm and protected from the pressure of bedclothes. It is important to handle the patient with care because of the pain and sensitiveness of the nerves in the extremities. There is no specific treatment in the early stage which influences either the amount of paralysis or its subsequent recovery. In spite of this a great deal can be done to bring back power to paralyzed limbs. It is important to keep the limbs warm and in normal position and to exercise the joints during convalescence so that they may not become stiff. Massage and passive motion after tenderness is gone and the education of the child to use the paralyzed extremities are the most important factors in restoring power. A warning should be given that the habit parents have of urging a child to use a paralyzed extremity too soon only leads to greater permanent paralysis. Recovery of power is most rapid during the first month, after which it goes on more slowly. For at least two or three years massage, education of the muscles, and proper apparatus, if necessary, etc., should be faithfully followed up in order that as much power as possible be restored to paralyzed extremities.

SYPHILIS

Definition.—Syphilis is an infectious disease characterized by three stages—the primary and secondary, which are manifested by acute symptoms, and the tertiary, during which symptoms may develop at any time years after the initial infection.

Etiology.—Syphilis is caused by the *Treponema pallidum* or *Spirochæta pallida*. It is a spiral organism which is present in all the lesions that appear in the body. For diagnostic purposes, however, it is only possible to recover them from the initial sore and sometimes from the mucous patches in the mouth and throat in the secondary stage. The disease can usually be recognized clinically in the primary stage, but the diagnosis should be confirmed early by making smears, staining, and examining for the germs. Usually smears are made from the primary sore by scraping the surface with a scalpel and collecting on a slide the serum which exudes from the underlying surface. The smear is then stained by different methods and examined under the microscope as any smear is usually examined, or by the use of the so-called dark-field illuminator. There are a great many kinds of spirochetes, but this one is so characteristic in its appearance that a diagnosis can almost always be made from its peculiar shape, size, and staining characteristics.

After the initial sore heals it is not possible to use this method of diagnosis, except occasionally in mucous patches in the mouth and throat in the secondary stage. There is, however, a test which is widely used to confirm the diagnosis of the disease, to indicate whether a patient is responding to treatment and when he can be pronounced well. It is called the Wassermann test. In making the test, blood or spinal fluid is taken from the patient. About 5 c.c. of the blood is usually collected in a test-tube from a vein in the arm. The serum is allowed to separate from

the clot and this serum is used in the test. When spinal fluid is tested no previous preparation is required, the fluid as drawn from the spinal canal being used. The test itself is called a *complement fixation test,* which is really a very complicated biochemical reaction. The results are reported usually by +, ++, +++, or ++++, indicating the strength of the reaction. In cases of syphilis this test is negative until the patient has had the initial

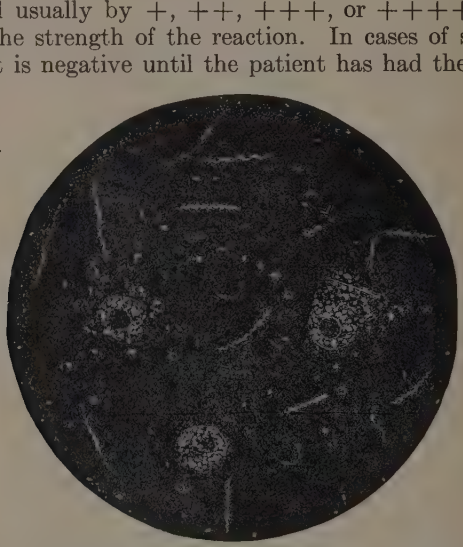

Fig. 5.—Treponema pallidum appearing as bright refractive body on a dark field, as shown by India ink or ultramicroscope (Park and Williams).

sore about ten days. It is always positive thereafter unless the patient is under treatment for a long time and is without any symptoms. If the test is done properly there is rarely any other disease, or any other condition than syphilis, which will produce a positive Wassermann.

There are two or three other tests which are worthy of mention. One is the luetin test which is a skin test for syphilis. Others are the Sigma and Kahn tests of the blood and spinal fluid, and the so-called *gold chlorid* test of the spinal fluid.

Syphilis is purely a contact disease. It is almost always contracted through sexual intercourse, and the primary sore is almost always on the genitals. Innocent transmission of the disease is not, however, uncommon through contact, as by kissing, when one person has a chancre on the lip or mucous patches in the mouth, or by any contact with other open lesions, particularly in the early stages of the disease. It is, however, possible to contract the disease in the tertiary stage, but it is much less common. There is one other example of innocent transmission, namely, from mother to child. A syphilitic mother may transmit the disease to her child in utero, the germs passing through the placenta. It used to be thought that a syphilitic father could transmit the disease even though the mother was not syphilitic, but this is not true. Syphilis in a woman is often overlooked and was not so frequently recognized before the introduction of the Wassermann test.

Syphilis is one of the scourges of the world. It exists in almost every country. It is claimed that the disease was transmitted from America back to Europe during the early explorations in this country, but there is good reason to believe that the disease existed in Asiatic countries before the Christian Era, so that any epidemic which may have been started in Europe from America was not the beginning of the disease.

Syphilitics very rarely die in the primary and secondary stages of the disease. It is only during the tertiary stage, when some organ or organs of the body are seriously diseased, that death ensues. It is, however, not only the cause of a great deal of illness and domestic unhappiness, but results, many years after the primary lesion, in a very large number of deaths. This disease, like other venereal diseases, has been shrouded in mystery so far as the public is concerned until very recently. It was looked upon as one of the visitations of Providence, and the very name was mentioned in a whisper. This attitude is undoubtedly wrong. Quite apart from the moral standpoint it is a

contagious disease just as much as scarlet fever or diphtheria, and causes a great deal of suffering, and every legitimate effort should be made to control it. In order to bring this about the public must be educated about the disease. People must be taught how it is transmitted, what it is like, and what human devastation is wrought by it.

Prophylactic measures for soldiers have met with considerable success and are used by the armies of many nations. These measures have been found impracticable in civil life and have not resulted in success. The only certain method of prevention is abstention from illegitimate intercourse.

Incubation Period.—From the time of contact with a syphilitic sore a period of about three weeks, sometimes more, sometimes less, must elapse before the primary sore develops.

Symptoms and Signs.—*Primary Syphilis.*—Usually the primary sore is on the genitals and is usually spoken of as a hard chancre. There is another type of genital sore which is not caused by syphilis, the so-called soft chancre. The hard chancre increases in size and lasts a very variable time, depending upon whether the patient receives treatment or not. If early and efficient treatment has been administered it disappears very rapidly. If no treatment is given it may last for weeks or even months. From this initial sore, which is alive with spirochetes, the germs are transmitted through the lymph-channels, first to the glands in the groin, and from there they are distributed not only to the other glands in the body, but may lodge in various organs, being carried by the blood-stream. Where they stop is more or less of an accident. The distribution of the spirochetes at this stage of the disease determines to a large extent what organs, if any, will be affected later in life.

Secondary Syphilis.—In about six weeks from the beginning of the primary sore, in most instances, the secondary symptoms appear. The secondary symptoms

consist principally of an eruption upon the body and inflammation and mucous patches in the mouth and throat. Not infrequently at this stage of the disease an iritis and nervous and other symptoms occur. The eruption is usually a symmetrical, copper-colored, spotted eruption which covers the body and lasts for a few weeks, or may persist for months if no treatment is given. The eruption itself is either macular, papular or pustular, though it may sometimes assume other forms. The mucous patches appear most frequently in the throat or mouth and consist of a white or yellowish, more or less firmly attached membrane or exudate, and are accompanied by redness and swelling. Another characteristic feature of the disease at this stage is enlargement of the glands, noticeably those in the groins, the back of the neck, and on the inside of the elbow. The length of the secondary stage varies considerably. It is determined by the severity of the disease itself and the character of the treatment. Under good treatment the rash and other signs disappear very rapidly.

Tertiary Syphilis.—Symptoms of this stage of the disease may appear in a few weeks, a few months, or only after many years. Whether it appears or not again depends largely upon the treatment which has been previously given. Untreated in the early stages few cases escape tertiary lesions. On the other hand, if efficient treatment has been administered early the chance of late lesions occurring is comparatively small. But it is important to remember that even the most efficient treatment will not always prevent the appearance of tertiary lesions. The tertiary lesions may affect any of the tissues in the body. The more common lesions of this stage of the disease are cutaneous lesions, disease of the bones, disease of the liver, disease of the heart and blood-vessels, disease of the glands, disease of the brain and cord, disease of the lungs, stomach and other parts of the body, all of which are destructive in character. The most common forms of disease of the nervous system caused by

syphilis are tabes dorsalis and paresis, although there are other types of disease of the brain and cord.

Congenital syphilis is a very serious as well as a most unfortunate form of the disease. A large percentage of syphilitic mothers will miscarry. At other times the fetus will be born prematurely, or at term, showing evidences of syphilis. Evidence of infection in the child may be apparent at birth or may appear within the first few weeks or few months of life. The signs of the disease at this period are most commonly cutaneous lesions, although various organs, particularly the liver and spleen, are often involved. A certain number of syphilitic children who appear healthy at birth may later, particularly about puberty, develop tertiary symptoms of syphilis. Destructive disease of the bones and other parts of the body, particularly of the nose and throat, and diseases of the nervous system, such as tabes, are the usual lesions at this time.

The spirochetes which are distributed in the body during the primary and secondary stages may lie dormant for months and many years in one or many organs. They may, however, at any time become active and cause syphilitic lesions. This quiescent period is called a latent period, and a person is said to have latent syphilis just as one may have latent tuberculosis.

Treatment.—No honest physician ever promises a patient who comes to him for treatment for syphilis that he will cure him. As a matter of fact, if a patient is efficiently treated for a sufficiently long period of time he has a very good chance of being protected against later manifestations of the disease. The most efficient drug or chemical is arsphenamin There are many forms of this chemical, such as salvarsan, neosalvarsan, sulpharsphenamin, etc., but they are all about equally efficient. The chemical is usually given in solution intravenously in doses of from 0.1 to 0.6 gram. The number of treatments is determined by the disappearance of the symptoms and the repeated examination of the blood by the Wassermann test. The

treatment is usually given in series, and between each series some other drug, particularly mercury in some form, is used.

The use of arsphenamin is not without its dangers. Sudden death very rarely occurs, but reactions, sometimes slight and sometimes alarming, are not so rare. These reactions usually are due to faulty preparation of the chemical or the solutions in which it is given, or to overdosage in sensitized patients. These reactions usually appear immediately after administration, but later symptoms may occur in a few days or in two or three weeks, such as scarlet-fever-like eruptions and jaundice. In competent hands the use of arsphenamin is a very safe remedy. Sometimes arsphenamin is used intramuscularly. Objection to the intramuscular use is that the chemical is very irritating and may produce serious sloughing of the tissues. The intramuscular route is more commonly used in the treatment of babies in whom intravenous medication is sometimes difficult.

There are two or three other remedies which are employed as adjuvants to salvarsan. Mercury, which has been used for centuries previous to the introduction of arsphenamin, is the most valuable. Bismuth is employed quite extensively at the present time. These drugs are employed alone in certain forms of the disease, but are more often used between series of arsphenamin treatments. Potassium iodid is also occasionally employed.

The earlier the treatment is begun, the more successful will be its results. Patients who have treatment early in the primary stage are quite likely to be entirely cured, and even if it is begun in the secondary stage the outcome is comparatively good. But when treatment is first instituted in the late stages of the disease, while it may clear up the ulcers, osteomyelitis of the bones, gummata of the liver, etc., it is very difficult to be assured that a cure is effected. The treatment of paresis, tabes, and diseases of the circulatory system with arsphenamin has, up to the present time, sometimes relieved symptoms, but results in few cures.

A person should be under treatment for at least two years or, better, for a period of four years. It should be intensive in the beginning and intermittent during the observation period.

The most frequent and difficult question that is asked a physician, particularly by his male patients, is how soon is it safe for them to be married. So mephysicians are more conservative than others, but the consensus of medical opinion is that a man should have been under treatment and observation and without symptoms for about four years.

GONORRHEA

Definition.—Gonorrhea is an acute, venereal disease which often becomes chronic, affecting usually the genital organs, and characterized by inflammation and a purulent discharge from the urethra or vagina.

Etiology.—The cause of this disease is the *gonococcus*. This organism can be easily found in the acute stages of the disease, but when the disease becomes chronic it is much more difficult to recover. It is a small diplococcus which is very hard to grow in the laboratory. However, because of its peculiar shape, distribution, and arrangement, it can be recognized under the microscope after it has been properly stained. The staining and recognition of this organism in smears made from the discharge is a very important help in the diagnosis of the disease.

There is sometimes used in the treatment of the disease a vaccine made of these germs. Its value, however, is more or less doubtful, although it is sometimes useful in the treatment of certain complications.

Epidemiology.—Gonorrhea is a very common disease. It is as much a contagious or transmissible disease as scarlet fever or diphtheria and should be treated as such. Epidemics of this disease are not uncommon in the smaller towns and cities and in institutions among children. It is usually a disease affecting the genital organs and is acquired through sexual intercourse. It may, however, be acquired in an innocent manner and frequently is. Gonorrheal ophthalmia in babies and sometimes gonorrheal conjunctivitis in children, or even in adults, gonorrheal vaginitis, and occasionally urethritis in male children, are usually contracted innocently. Physicians occasionally contract gonorrheal conjunctivitis from the spattering of pus into the eye or to its transfer on the fingers. A person is most highly infectious during the acute period of the

disease. Very often, however, the disease becomes more or less chronic and the discharge becomes intermittent and contains very few germs. Such persons are carriers and distributors of the disease. In fact, the disease may be present, particularly in women, over a period of many years. To determine whether a person is probably free from infection it is necessary to know whether there is any discharge and to examine smears of it for the gonococcus.

During the war, among the soldiers of the various armies, prophylactic treatment after intercourse was carried out rather rigidly. This practice did a great deal of good. Some attempts have been made to carry out

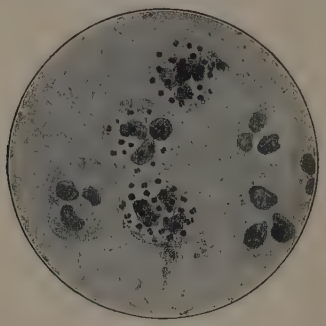

Fig. 6.—Gonococci in urethral pus (McFarland).

prophylaxis in civil life, but it has proved unpopular and cannot be carried out in the way that will result in much success. The prophylactic treatment consists of an application of certain ointments and the use of certain irrigations immediately after intercourse. It must be done very promptly after exposure to be efficient.

Incubation Period.—The incubation period of gonorrhea is from two to seven days.

Symptoms and Signs.—The earliest symptoms of genital gonorrhea *in the male* are burning on urination, followed by a serous discharge, and later by a purulent discharge from the urethra. The tendency of the disease is to extend backward into the deep urethra where it may become

chronic. In cases where it extends into the deep urethra it often extends to the prostate, bladder, seminal vesicles, and testicles.

In the female it begins, usually, as a urethritis, as it does in the male, or in glands in the vulva. It is also more likely to become chronic. It frequently extends into the bladder and into the uterus and is particularly common and chronic in the cervix. Often the inflammation extends into the Fallopian tubes, producing abscesses which involve both tubes and ovaries. This condition is often spoken of as inflammation of the bowels. It usually becomes chronic and may last for many years, with periods of quiescence succeeded by occasional acute attacks. From 25 to 50 per cent. of the operations on women in gynecological wards are for removal of diseased tubes and ovaries the result of gonorrhea.

The germs may affect other parts of the body in both men and women. The joints, more often the larger joints, become infected, producing acute and chronic rheumatism. The disease may also affect the valves of the heart, producing an endocarditis. In men the most frequent and serious complication which follows gonorrhea is stricture of the urethra produced by chronic inflammation in the deep urethra. This may be so severe as to obstruct urination.

Gonorrheal Ophthalmia.—This is an acute purulent conjunctivitis caused by the gonococcus. It usually occurs within a few days after birth, the infection being contracted from the mother while the child passes through the birth canal. It is a very serious disease of the eyes and a large percentage of all blindness is due to it. It can be prevented in almost all instances if the baby's eyes are treated immediately after birth with 1 or 2 drops of a 1 or 2 per cent. silver nitrate solution. This is a routine practice in lying-in hospitals and usually is carried out by physicians in private practice.

Gonorrheal Vaginitis.—This form of the disease is usually transmitted from one girl to another by indirect contact,

usually by the fingers. It is, however, not infrequently contracted from parents and is quite often acquired by sexual intercourse. It is a quite common disease, and while it is rarely serious as to life, it is very chronic. It is characterized by a purulent vaginal discharge, the inflammation being usually in the vaginal walls. Sometimes it affects the cervix and very rarely the Fallopian tubes. It may last for months and may even last intermittently for years. After apparent cure, the disease frequently recurs not once, but many times, even in spite of the best known treatment. It is not infrequently epidemic in institutions. It is customary throughout the country to take vaginal smears of all girl patients at the time of admission to the hospital, whether they have any vaginal discharge or not. Most children's hospitals refuse to admit patients who have positive gonococcus smears. It can, however, be easily controlled in a hopsital by the observation of proper technique.

Treatment.—*Genital Gonorrhea.*—This consists of plenty of fluids in the early stage and the administration of certain drugs, which by their effect upon the urine makes it less irritating. Local treatments in the early stage consists of irrigations or instillations of silver preparations. Later on, when it becomes subacute, it is necessary to use other irrigations, prostate massage, etc. In men abscess of the prostate is not uncommon and has to be treated by surgical methods. Likewise the stricture of the urethra, the result of chronic gonorrhea, requires surgical treatment. In women the acute stage of the disease in the urethra is not so difficult to treat as in men, and is not quite as persistent. Disease of the cervix is very chronic and very difficult to cure except by operative procedure. The acute inflammation of the tubes and ovaries usually subsides under rest and hot douches, but the disease can rarely be eradicated except by their removal.

Gonorrheal Ophthalmia.—Babies with gonorrheal conjunctivitis need constant attention, and in hospitals special nurses are assigned to them. The eyes should be flushed

frequently with boric acid solution to remove the pus, which forms very rapidly, followed by drops of various kinds, most frequently of silver solutions. Sometimes cold compresses are necessary, as there may be a great deal of swelling of the lids. The danger signal is haziness or ulceration of the cornea.

Gonorrheal Vaginitis.—The treatment of this condition is rather discouraging, although a great deal can be done to improve the condition. Irrigations or instillations of silver solutions are most commonly used. When the disease, however, has reached the cervix it is very difficult to treat because the parts are so small that local treatment is almost impossible. In most cases, however, even though it does become more or less chronic, the disease disappears as the child grows older. Gonorrheal vaccine is sometimes used. Its use is justifiable under certain conditions, but too much cannot be expected of its administration.

TUBERCULOSIS

Definition.—Tuberculosis is a chronic disease which is characterized by the formation of nodules or tubercles. It may attack any part of the body, producing inflammation and a disintegration of the tissues.

Etiology.—The cause of the disease is the *tubercle bacillus*. This germ is an ordinary sized bacillus which can be grown by artificial culture methods, though it grows slowly and requires special media. It can almost always be recognized under the microscope because of its peculiar staining qualities. It is usually found in the sputum, but may also be found in discharges from tuberculous wounds, pleural fluid, peritoneal fluid, etc. Guinea-pigs are very susceptible to tuberculosis, and if smears do not show germs in the sputum, pleural fluid, spinal fluid, or discharge from wounds, these may be injected into the pigs, which will die within six weeks of tuberculosis if any tubercle bacilli are present.

It has been generally believed that this germ can live outside the human body for a long time, but it is not true. It is influenced by the same conditions that ordinary disease-producing bacteria are, and dies promptly under exposure to sunlight and drying.

Infection and Immunity.—Tuberculosis is not only a disease of human beings but also of animals, particularly cattle, although many other animals are susceptible to it. Three types of the disease are recognized—the human, the bovine or cattle tuberculosis, and the avian, which is tuberculosis in birds. Man receives his infection not only, therefore, from other human beings but also from animals. The only animals that are of any particular danger to human beings, except under rare conditions, are cattle, particularly cows. The greatest danger is from the milk which is taken from tuberculous cows. The disease can

be recognized in animals by clinical examination and by the use of the tuberculin test. The meat of tuberculous animals is sometimes a source of infection, but such danger is small, for the germs are killed by cooking. About 90 per cent. of all infection, however, is from human sources.

Tuberculosis infection in most cases probably takes place in childhood. It was formerly believed that infants born of tuberculous parents were infected before birth. While this may take place occasionally, it is exceedingly rare. Infection usually takes place after birth. The

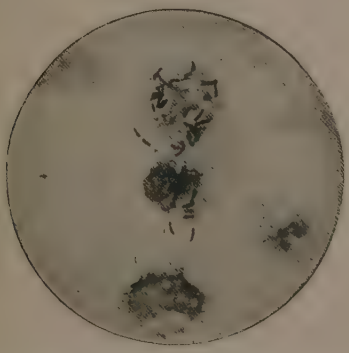

Fig. 7.—Bacillus tuberculosis, human, in pus from lung. Zettnow prep. (Kolle and Wassermann).

source of infection is usually some human being who has tuberculosis, most commonly some one in the same family. Children, particularly, are susceptible to infection from milk. Bovine infection in children is much more common than among adults. The germs escape from the human body by different routes, depending upon where the disease exists. Most commonly it is by the sputum which comes from tuberculous lungs. It may, however, be contracted from the discharges from tuberculous sinuses from glands, bones, and other lesions. A patient who has

tuberculosis may be infectious for many years, perhaps not continuously, but during periods of activity. Long-continued association, particularly in the same family, with a case of tuberculosis, whether apparently active or not, is likely to result in infection of every member of the family sooner or later. It does not necessarily follow, however, that every member of the family will contract active tuberculosis, but every member will have at least a little tuberculosis.

Once infected with tuberculosis germs, always infected. The germs lie dormant in the glands at the root of the lungs, in the glands in the neck and other parts of the body, and in diseased tissues which apparently have entirely healed. They may lie dormant for years until, because of physical exhaustion, lack of food, or injury of the infected person, they may become active and start a disease process. Sometimes reinfections take place after apparent cure.

Tuberculosis is a contact disease. The germs in the sputum, which is usually the source of infection, get into the body through direct contact, as by kissing, or indirect contact on fingers, etc. Anything contaminated with the sputum which gets into the mouth may cause the disease. There is some danger of infection to those exposed at close range to the violent cough of tuberculous patients. The germs, however, are not floating about through the atmosphere even in wards where there are many cases of the disease. As already stated, infection may come from infected milk, particularly in children.

The actual entrance of the germs into the tissues is not well understood. They sometimes enter the glands of the neck through the tonsils, sometimes they enter through ulcers in intestinal tract, or by absorption, producing infection of the mesenteric glands and tuberculous peritonitis. In some manner the germs find their way into the glands at the root of the lungs, which is the most common form of early infection, often resulting in pulmonary tuberculosis.

Many people become immune to the disease without having any known tuberculous infection, although such persons have, of course, had a little tuberculosis in some part of the body. The larger the number of persons who have acquired immunity in this way, the fewer will be the number of active cases of tuberculosis in the community. In cities the number of persons who are thus immunized by having *a little* tuberculosis is much greater than among those who live in the country, because of more chances of infection in a city. Different races and nationalities vary in their susceptibility and resistance to the disease. The negro and American Indian are the most susceptible, while people of Jewish blood are the most resistant.

Vaccines and toxins of various kinds have been produced by utilizing the tubercle bacillus and are called tuberculins. Tuberculin is employed for two purposes—for diagnosis and for treatment. Its use as a preventive has been a failure thus far. The most common preparation now employed is Koch's "O. T." or old tuberculin, for determining susceptibility and for treatment. A person suspected of having tuberculosis may be tested in two ways—by the von Pirquet or skin test or the subcutaneous method. The von Pirquet test consists of the injection or scratching into the skin of a small amount of tuberculin. If within twenty-four hours a red area develops about the site of injection, it indicates that the person has or has had tuberculosis, but it does not indicate whether it is active or not. The second or subcutaneous test consists of the injection of a dose of tuberculin under the skin. If the patient has the disease there will follow a sharp rise in temperature and increased activity at the site of the lesion wherever it may be. This is a better test of activity than the von Pirquet test. The skin test is most valuable in examining small children because it is so frequently positive in adults in good health that it indicates very little. Tuberculin is sometimes used in the treatment of tuberculosis, particularly the glandular forms.

Epidemiology.—Tuberculosis has, up to the last few

years, been the cause of more deaths than any other disease. It now stands fifth, with diseases of the heart and circulation leading. It has been a scourge in all countries from time immemorial. The death rate, however, in many countries, particularly in the United States, has dropped tremendously within the last twenty-five or thirty years. It began to drop in certain countries as early as 1870 or thereabouts, but during the last ten or fifteen years the decrease has been particularly rapid. The principal reasons for this drop in mortality are: the easier life which people in general enjoy; the greater variety and amount of food which they are able to afford; the isolation of patients in sanitariums and hospitals; education of the people how the disease is spread; sleeping with open windows; the efforts of tuberculosis associations, national and local, which seek to find out where the active cases are located, to see that they are properly advised, and that the family receives sufficient amount of food, for in the last analysis food is the greatest protection against active tuberculosis. The death rate in the United States in 1925 was 89 per 100,000, in 1900 it was 202.

Pathology.—When the germ enters the body it begins to multiply and produces a toxin. This toxin has the effect upon the local tissues of producing a peculiar pathological process called tubercles or nodules. These little tubercles are tiny affairs and they group together producing larger tubercles. The tendency of the disease is to spread and for the tissues which are invaded to break down. It spreads directly from point to point, or the germs may be transmitted through lympathics and the blood to various parts of the body.

Symptoms and Signs.—The most common form of tuberculosis is pulmonary or lung tuberculosis. This form of the disease is most common during early adult life, between the ages of twenty and forty years. It is less common in children, although it may be present even in infants. It is more common in old age than is generally realized.

The early symptoms of pulmonary tuberculosis are protracted cough, loss of weight and strength, and a little evening temperature of 99° to 100° F. Sometimes cough is absent or very slight. Lassitude and "indigestion" are early symptoms. As the disease progresses the cough becomes worse, the patient begins to expectorate, first whitish material which later becomes purulent and which may be stained with blood. Night-sweats, greater loss of weight and strength, more temperature, and sometimes pulmonary hemorrhages occur as the disease progresses. The hemorrhage is due to the erosion of the walls of blood-vessels by the breaking down process in the lung tissue. In the later stages of the disease the patient becomes very emaciated, the temperature is of the septic type, while he is racked by a severe cough. The process in the lungs begins, usually, at the apex on the right side. Later it spreads to other parts of the lungs. The disease may involve only the pleura, producing a pleurisy. This is a favorable type of tuberculosis. A tuberculous empyema is not uncommon. In children the most common form of pulmonary involvement is the so-called *hilum* tuberculosis, which means enlarged glands at the root of the lungs. During the course of the disease many other organs may become involved before the fatal termination.

Non-pulmonary Forms of Tuberculosis.—Tuberculosis of the glands, particularly the cervical, mesenteric, and the bronchial glands, is common. Tuberculosis of the bones and joints is frequent. Children are particularly susceptible to gland, bone, and joint tuberculosis. Joint and bone tuberculosis usually begins at the growing end of the bones—the epiphyses. Common sites for joint disease are the knee and hip and the spine, the latter producing deformities of the back. Tuberculous meningitis, intestinal tuberculosis, with or without peritonitis; phlyctenular keratitis, a disease of the eyes; tuberculosis of the testicles, bladder, kidney, and of the pelvic organs of the female are other common forms of the disease. In fact, any of the tissues of the body may be invaded.

The *x*-ray is a very valuable agent not only in the diagnosis of tuberculosis of the bones but also of the lungs.

Treatment.—*Pulmonary Tuberculosis.*—There is no specific treatment for pulmonary tuberculosis. The most that can be done is to help nature in its efforts to withstand its ravages. Rest, the amount depending upon the extent and activity of the disease, plenty of nourishing food, and fresh air are the most important factors in the treatment of pulmonary tuberculosis. Treatment can be carried out at home, but it is done much better in a sanatorium. It is important that every patient go to the sanatorium, even if only for a short period, where he will learn what he ought to do to bring back his own health, and to protect others, particularly members of his own family. After such education, treatment at home may be made successful if he is supervised by a physician and visiting nurse. The treatment requires many months, sometimes years. The earlier the treatment is begun, the better the outcome. The family should have sufficient funds to provide a separate room for the patient and plenty of good nourishing food.

The treatment of *non-pulmonary tuberculosis* depends entirely upon the part of the body that is involved. Surgery of the glands and other tuberculous lesions is resorted to far less frequently than formerly. Exposure to sunlight, fresh air, good food, and rest are the most important factors in the treatment of bone and glandular and other non-pulmonary forms of tuberculosis. Artificial light may be used when sunlight is not available. For some reason intense sunlight treatment of pulmonary tuberculosis patients has not been successful, in fact, it is contraindicated. Treatment must be continued for long periods of time because the disease heals slowly. Those suffering from bone or joint tuberculosis should be under the care of specialists. Surgery is also indicated in certain instances. The best results are obtained in hospitals and sanatoriums for these types of tuberculosis.

Treatment either at home or, better, in a hospital or

sanatorium near home is far preferable to going to some better climate, unless the patient is supplied with sufficient money to pay his way. Climate makes some difference in the comfort of patients and the outcome of the disease, but it is relatively an unimportant factor. Private sanatoriums are scattered all over the country, but are particularly numerous in the South and West. Persons found to have tuberculosis often start for these resorts, either on their own responsibility or on the advice of a physician or a friend. Such a course of action is justifiable only when the patient has money enough to afford sanatorium treatment over a considerable period of time. Thousands of poor tuberculous subjects have been stranded in the West and South only to become public charges.

LEPROSY

Definition.—Leprosy is a very chronic disease characterized by the production of nodules in the subcutaneous and submucous tissues and by progressive destruction and mutilation.

There are two types of the disease—nodular and anesthetic.

Etiology and Epidemiology.—The cause of leprosy is the *Bacillus leprœ.* The disease is contracted by long and intimate contact with leprous patients who are infectious as long as there are any open lesions.

Leprosy is perhaps the most dreaded of all diseases, and yet exposure to it is less dangerous than exposure to a case of tuberculosis. It still exists, particularly in Asia and Africa, but in progressive countries it is a rare disease. During the Middle Ages lepers were concentrated into colonies and institutions, and today, whether from this practice or for some other reason, Europe is practically free from the disease. There are lepers at large in London, New York, and other large cities, but they are and should be confined to leper colonies or hospitals. The United States Public Health Service conducts a sanatorium in Louisiana to which patients in the United States are sent if possible. A considerable number of lepers are being cured by treatment with chaulmoogra oil.

MALARIA

Definition.—Malaria is both an acute and chronic disease characterized by severe periodic chills and fever, the intervals being nearly free from symptoms, and an enlarged spleen. Patients do not often die in an acute attack, but if, as is sometimes the case, treatment does not kill all the germs in the blood, the disease may become chronic, recurring at intervals, until serious damage to certain organs has been done. The germs live continually in the spleen in uncured cases.

Etiology and Epidemiology.—The disease is caused by the *Plasmodium malariæ*. It is transmitted by the bite of the infected *Anopheles mosquito* and the germs enter the red corpuscles of the blood in which they mature. They destroy the red cells in which they develop and, after their release, they enter other red cells. About eight days must elapse between the time the mosquito bites a person sick with malaria before it can transmit it to well persons. Infected mosquitoes remain infected during their lifetime. They are much more likely to bite during the night than during the daytime.

Malaria is a common disease in tropical and semi-tropical countries. It may be almost as common in temperate regions, but is not so fatal. During recent years great efforts to diminish its prevalence have been made with considerable success. The effective measures for controlling the disease are, first, the prevention of the breeding of the malarial mosquito by oiling and draining breeding spots; screening of all houses in malarial districts and careful screening of malarial patients; the routine use of quinin to prevent the disease and to kill the germs in those already infected, in doses from 3 to 6 grains a day for prophylaxis.

Treatment.—Quinin is almost a specific cure for malaria. If promptly administered it will kill the germs almost immediately and the chills and fever will disappear. Cases which have become chronic are less responsive, but usually can be cured, although it takes longer. Anemia and damage to spleen and liver may, however, have already taken place.

YELLOW FEVER

Definition.—Yellow fever is an acute disease characterized by sudden onset with a chill, fever, vomiting, jaundice, great prostration, and is attended with a very high fatality rate.

Etiology and Epidemiology.—The disease is caused by the *Leptospira icteroides* which is found in the blood of patients ill with the disease. It is transmitted by the bite of an infected female mosquito, the *Aëdes ægypti*, formerly known as the *Stegomyia calopus*. Ten days must elapse from the time the mosquito feeds upon the yellow fever patient before she can transmit it to well persons.

This disease, formerly the most dreaded of all tropical diseases, has been almost driven from the earth. The only remaining infected areas are a small section of the coast of Brazil and the west coast of Africa. This is, perhaps, the best example of the possibilities of preventive medicine, and its suppression has been accomplished by screening the sick and the homes of the well, and by the destruction of the breeding places of the yellow fever mosquito wherever the disease exists. The control of this disease made possible the building of the Panama Canal.

One attack protects against a second attack. Patients do not become carriers.

TYPHUS FEVER, MEXICAN TYPHUS, AND BRILL'S DISEASE

Definition.—Typhus fever is an acute disease characterized by sudden onset with fever, a spotted hemorrhagic eruption, delirium and prostration, and by sudden termination at the end of two weeks.

Etiology and Epidemiology.—It has been proved that this disease is transmitted by the bite of the body louse and sometimes of the head louse. After feeding upon a person sick with typhus fever these lice become infected and can, as long as they live, transmit the disease by biting well persons. It is believed that the germ which causes typhus fever is the *Rickettsia prowazeki*, microscopic bodies which have been recovered from the intestines of infected lice. The germs are in the circulation of the typhus patient only during the febrile period. Patients do not become carriers.

Typhus fever has long been known, and in former centuries appeared in great outbreaks, causing an untold number of deaths. During the World War it again became epidemic in eastern Europe, particularly in the Balkan States, and caused thousands of deaths. It is endemic in eastern Europe, Northern Africa, Asia, and elsewhere. It does not spread to any extent in countries whose inhabitants are not louse infected.

The control of the disease depends entirely upon delousing, particularly of patients and contacts. On admission patients' clothing should at once be subjected to steam or hot air to kill the lice. In hospitals for typhus, during outbreaks, it is important for physicians, nurses, and attendants to wear louse proof clothing while on duty. In hospitals to which the disease is only occasion-

ally admitted this protection is not necessary so long as rubber gloves and a gown are worn while delousing the patient.

To prevent the spread of the disease in the community the general population must be deloused. Its entrance to a country may be prevented by delousing emigrants from typhus infected districts.

One attack protects against a second attack.

PLAGUE—BLACK DEATH

Definition.—Bubonic plague is an acute disease which is usually characterized by fever, buboes or enlarged glands, and attended with a very high fatality rate. There are two other types of the disease—pneumonic and septicemic.

Etiology and Epidemiology.—The cause of the disease is the *Bacillus pestis*.

Plague, primarily, is a disease of rodents from which man receives his infection. Before a human outbreak begins there is a previous outbreak among rodents. Bubonic and septicemic plague are transmitted to man by the bite of the rat flea from rats sick with plague. Pneumonic plague is transmitted by contact with the sputum of patients sick with this form of the disease, which is the most severe and highly transmissible type.

Plague is a most destructive and dreaded disease. It is primarily an Asiatic disease, but it spreads to all parts of the world at intervals, and has found its way several times to the Gulf and Pacific Coasts of the United States. The control of the disease depends upon measures to prevent importation of rats on ships, the killing of rats and other rodents, and rat-proofing of buildings. Seaport towns and cities are more endangered than those inland.

One attack protects against a second attack.

HOOKWORM DISEASE

Definition.—Hookworm disease is a chronic disease characterized by anemia and weakness and is due to the activity of a parasite in the small intestines.

Fig. 8.—Necator americanus: *A*, Male; *B*, female. (× 6 after Placentia in Brumpt.)

Etiology and Epidemiology.—The cause of the disease is a hookworm, the American variety being called the *Necator americanus*. These parasites are about ½ inch

long and they fasten themselves by suckers to the walls of the small intestines.

Infection takes place through the skin, particularly of the feet. The larvæ of the hookworm, which are present in soil infected with stools of hookworm subjects, gain entrance through the skin, usually of people who go barefoot, producing an eruption called *ground itch*. These larvæ are carried by the circulation in a roundabout way to the intestinal tract where the adult worm hatches out.

Prevention of the disease is important, for it is very common in tropical countries and reduces its victims to semi-invalidism. Methods of control consist of the prevention of soil pollution by proper disposal of the excreta and its disinfection, and by the treatment of those infected with thymol, or some other drug, to rid the victims of the parasite. It is also important to educate the people in infected districts not to go barefoot.

The disease is common in tropical and semitropical countries. It is common in the southern part of the United States, where considerable progress has been made toward its eradication by the efforts of such agencies as the United States Public Health Service and the International Health Board.

RABIES—HYDROPHOBIA

Definition.—Rabies is an acute disease affecting the central nervous system and characterized by paralyses, particularly of the muscles of the throat, violent nervous symptoms, and almost always a fatal termination.

Etiology and Epidemiology.—Rabies is a disease of dogs, cats, and occasionally of other animals, and man usually contracts it by the bite of a rabid dog. The germs, rabies virus, are in the saliva of the dogs and gain entrance to the body at the time of a bite, although the disease may rarely be transmitted by licking if there happens to be a break in the skin. The incubation period is long and variable, from fourteen days to one year, usually about forty days in man.

The disease is diagnosed by finding the so-called *Negri* bodies in the brain of a dog suspected of being rabid. A suspected dog should not be killed at once, but kept under observation. If he is rabid he will die within a few days. It is not safe to wait more than ten days before beginning Pasteur treatment.

Treatment.—The Pasteur treatment is a prophylactic treatment which covers a period of two or three weeks. It consists of daily injections of a preparation made from the dried spinal cords of rabbits which have been killed at various stages of rabies produced by inoculation of spinal cord or brain tissue of a rabid animal. This treatment seldom fails to protect if properly administered. When rabies is epidemic among dogs it is customary to require that all dogs be muzzled when out of doors. Immunization of dogs by the Pasteur treatment is of much more value in preventing its spread.

TETANUS—LOCKJAW

Definition.—Tetanus is an acute disease characterized by continuous muscular contraction, either local or general, and accompanied by severe periodic and painful muscular spasms or convulsions.

Etiology and Epidemiology.—Tetanus is caused by the *Bacillus tetani*, a very resistant sporiferous germ.

The normal habitat of these organisms is the intestines of horses, cattle, and occasionally other animals. Infection usually takes place through a wound, particularly a penetrating one, the germ having been introduced at the time of accident on soil, dirt, etc., which has been polluted by the droppings of animals. It is most common among those who live on farms or in the environment of horses. Infection takes place also through blank cartridge wounds, the germs being present in the wadding, and these are particularly common on the Fourth of July. War tetanus from gunshot wounds has been common in past wars, but during the World War there were few deaths, even though soldiers lived in trenches and were much exposed to soil pollution, because tetanus antitoxin was used as a prophylactic.

Tetanus antitoxin is produced by the inoculation of horses with tetanus toxin. It is a very reliable preventive measure if given early enough. It should be given immediately after blank-cartridge and gunshot wounds, and after any wound, particularly a penetrating one, if received under circumstances in which soil pollution may have taken place. The prophylactic dose is usually 1500 units.

Incubation Period.—This varies from five to fourteen days; the shorter it is, the more serious will be the attack.

Symptoms and Signs.—The most common beginning is a spasm of the muscles of the jaw, hence the name "lockjaw." The muscle spasm later becomes general, rendering the patient more or less helpless. Contraction of the

muscles of the back pulls the head backward, making an arch. Some muscular contraction is always present during the disease and is accompanied by periodic, severe contractions, which are very painful and greatly dreaded by the patient. It is a very exhausting disease and patients lose weight and strength. Those who succumb gradually become weaker and weaker. The fatality rate is high, but it is by no means a hopeless disease.

Treatment.—Absolute rest and quiet are essential. The slamming of a door may precipitate a convulsion. It is highly important to keep up nutrition with fluids and solid food. Spasms of the jaw often interfere seriously, but every effort should be made to administer as much food as possible.

Treatment with tetanus antitoxin is of great value, particularly when administered early. It is given intramuscularly, intravenously, and intraspinously. Drugs which help to relieve spasms and produce sleep are also valuable.

ANTHRAX—MALIGNANT PUSTULE

Definition.—Anthrax is an acute disease characterized by formation of a gangrenous sore, usually upon the skin, and by septicemia. Another type of the disease affects the lung—woolsorters' disease.

Etiology and Epidemiology.—The cause of the disease is *Bacillus anthracis*, a sporiferous and very resistant germ. Primarily anthrax is a disease of cattle, horses, etc., and man receives his infection from them by contact with sick or dead animals, or from infected hair or hides. The type of the disease which affects the lungs—woolsorters' disease—is contracted by inhaling the germs in dust from sheep pelts.

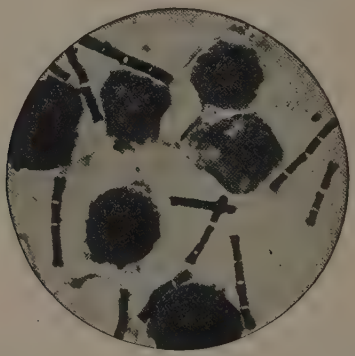

Fig. 9.—Bacillus of anthrax; × 2000 (Kolle and Wassermann).

Prevention of human anthrax depends on prevention of the disease in animals. Sick animals should be killed and buried or burned. Hides and hair should not be purchased from infected districts. Hair should be subjected to steam disinfection. Hides cannot be disinfected, and workers in tanneries and wool works should wear rubber gloves and rubber aprons.

Treatment.—There is no specific preventive of the disease, but anthrax serum, made by injecting horses with live organisms, has proved of great value in its treatment. It is injected about the anthrax sore, and is given both intravenously and intramuscularly.

GLANDERS

Definition.—Glanders is an acute and chronic disease, characterized by nodules and ulceration in the nose or in the skin, and is accompanied by a high fatality rate.

Etiology and Epidemiology.—The disease is caused by the *Bacillus mallei*, a very resistant germ.

Primarily it is a disease of horses and goats, and man receives his infection from them through contact. It is most common among hostlers and others associated with animals.

Diagnosis.—The diagnosis is made by recovering the bacilli from the lesions, or by the *mallein test*, which corresponds to the tuberculin test in tuberculosis.

The control of the disease depends upon destruction of infected horses, observation and mallein testing of all contact animals, and upon thorough disinfection of the stables occupied by infected animals.

CARE OF INFECTIOUS DISEASES AT HOME

When contagious disease hospitals were first erected during the latter part of the nineteenth century, it was hoped that by extensive hospitalization to stamp out scarlet fever and diphtheria. In many English cities as early as 1890 90 per cent. of the scarlet fever and diphtheria patients were hospitalized, yet scarlet fever is as frequent in London as ever, and diphtheria is even increasing. The explanation is very simple. When it is claimed that 90 per cent. of scarlet fever and diphtheria patients have been hospitalized the statement refers to recognized cases of these diseases. How many mild, unrecognized, and concealed cases there may have been, no one can even estimate, much less state exactly. Second, there are the carriers which are responsible for a considerable percentage of infections. These missed cases and carriers are the great health problem of today. And last, the first case in a family may not be recognized and removed early enough to avoid infection of other members of the family.

There is a very practical reason why universal hospitalization cannot be insisted upon, namely, the expense. It is not feasible to build and maintain hospitals which are large enough to accommodate all patients in serious outbreaks of infectious diseases.

Such a compulsory law would not be popular and there would be a tendency to conceal cases, either by not calling a doctor, or, unfortunately, because there are physicians who are willing to connive with the people and avoid notification.

For these reasons a more moderate course should be adopted. Compulsory removal should be insisted on in all cases where the patient cannot or will not be properly isolated, as, for instance, in large families, crowded tene-

ments, boarding houses, hotels, institutions of all kinds, including boarding schools, etc. It is wise to suggest the hospital as the place for all patients, but if the people are intelligent, the family small, and they are able financially to afford proper treatment at home, and particularly if they are willing to co-operate with the health department, such patients can be treated at home.

Isolation.—The object of proper home isolation is to prevent infection of the rest of the family, the neighbors, relatives, and friends. When a case of infectious disease is discovered, everybody else in the family should be examined carefully, not failing to take a temperature of all. It certainly is of little value to exercise great care in the isolation of the one obviously ill, and allow the father, mother, brother, or sister, who may be mildly ill, to associate with well members of the family or with the public. This is not an unusual happening and explains many failures of isolation.

The family should have a nurse if possible. If they are not able to do this, the mother should take care of the patient, but some one else in the family, or hired help, should do the housework. It is too much to expect of any mother to do both during the acute illness of the patient. If the patient is only slightly ill, or during convalescence, it is feasible, if the patient is not too much care, and the mother is physically able. During severe illness it may be necessary to have more than one person to care for the patient. The local health department should send in a nurse to show the mother how to carry out the details of isolation technique.

The method employed to prevent the patient infecting other members of the household should be the same as employed in a hospital. Necessarily it must be carried out with less equipment, but with a little thought and ingenuity isolation can be carried out very effectively.

The patient should occupy a room as near the bathroom as possible. This aids in the nursing care and provides a good place for hand-washing, etc. It is best that

the bathroom be given up wholly to this purpose, if possible. If the house does not afford a bathroom, any well-lighted and ventilated room can be used for the patient.

The patient should be confined to the room until quarantine is raised. No one should be allowed to go into the room except the mother, father, doctor, or nurse, and they should observe the rules which are to be outlined below. The door to the room may be left open so far as danger of infection is concerned, but it should be kept closed if necessary to keep other children out of the room or to keep the patient in the room.

The first step in isolation has already been mentioned, namely, to avoid personal contact between the sick and the well, except for those who must care for the patient. The second step is to see to it that nothing leaves the room or is used by anyone else which has not been freed from infection.

Hand-washing is of first importance. The hands should be carefully scrubbed. If there is a bathroom, the lavatory may be used. The water should be turned on by using a piece of toilet paper so as to avoid infecting the faucets, particularly if anyone else uses this bathroom. In case there is no bathroom, two basins should be supplied, one for water and one for a disinfecting solution. After each washing the water should be emptied into a pail and fresh water poured into the bowl. The basins can be placed just inside the patient's door.

A piece of bar soap, or liquid soap shaken from a bottle through a perforated stopper, may be used. A cheap vegetable scrub-brush should also be provided and this should be kept in a small dish, just large enough so that it can be covered with a disinfecting solution.

Hands should be scrubbed for at least two minutes. When the mother or nurse has a gown or outer garment on she should scrub first for one minute, remove the outer garment and hang it up, or lay it over a chair so that only the outside is exposed, and then proceed to scrub two

minutes longer. If there is warm water in the bathroom, it is not necessary to use a disinfecting solution on the hands, but washing in cold water from a pitcher is much less efficient and an antiseptic solution is then advisable. The most useful solution, although smelly, is sulphonaphthol, a teaspoonful to 2 quarts of water. The hands should be immersed after scrubbing for at least one minute (counting seconds). The solution should be changed once a day. There are other solutions which may be used, but they are either irritating or poisonous and are objectionable.

For wiping the hands paper towels should be supplied. They can be obtained almost anywhere. After use they should be thrown into a receptacle on the floor and burned when the receptacle is full. An old waste-basket, a pail, or a 20-pound bag, shaken open and pinned to the wall, may be used as a catch-all. No cloth towels should be used a second time before being washed.

Hands should be scrubbed whenever the nurse or mother leaves the patient to go to some other part of the house. Anyone else who enters the room and touches the doorknob or anything in the patient's room should, on leaving the room, scrub in the manner described. The hands should also be washed at other times when soiled with secretions.

Gowns.—Regular hospital gowns are seldom available, but large aprons or Mother Hubbard dresses can be used if they cover the clothing well. The dress sleeves should be rolled up to the elbows while caring for the patient. The way in which gowns should be used will depend on circumstances. If nurse or mother stays in the room with the patient night and day, when they go to other parts of the house, and after scrubbing their hands, this gown (uninfected outside) should be worn and hung or kept just outside the patient's door. Its purpose is to cover the infected clothing worn in the room. If they do not sleep in the room with the patient they should wear the gown while on duty and remove it during the scrubbing process, as already described.

Dishes.—All dishes after being used by the patient should be taken to the kitchen, put at once into a dish-pan, covered with water and boiled for at least ten minutes, and washed afterward. A special pan should be kept for this purpose, so that the mother or nurse may bring out the infected dishes and put them into the pan at once, for they must do nothing else about the kitchen until their hands are washed. The patient's tray (if one is used) can be kept in the room all the time.

Soiled Clothing.—This clothing should be put into a basket set aside for this purpose, and kept in the bath-room or in the patient's room. Before clothes are washed a boiler or large pan should be put on the stove partly filled with water. The basket of clothes should be brought out and the clothes removed directly to the boiler, in which they should be boiled for fifteen to twenty minutes before washing is done. The basket is returned to its proper place immediately after it is emptied.

Disposal of Excreta and Refuse.—Where there is a toilet in the bathroom, urine and feces can be emptied directly into it. If a privy is used, when emptying chamber vessels the seat should be covered by newspapers, placed there beforehand. If the disease is typhoid fever, before the excreta is removed from the room an equal quantity of chlorid of lime should be stirred in and the whole allowed to stand one hour before emptying. Whenever the closet is connected with a sewer this disinfection may be omitted if the sewage is chemically treated to kill disease germs. The bed-pan or vessel should be washed carefully and scalded after each use.

Food remnants, pieces of cloth or paper soiled with secretions, and other similar waste should be deposited in a paper bag which is opened and either pinned or stuck (by adhesive plaster) to something in the room, or placed upon a newspaper on the floor. It is very important that all infective secretions be disposed of at once, so they will be harmless.

Refuse may be burned in a coal stove, furnace, or incinerator in the yard.

While the patient is ill, anything removed from the patient's room should be treated as is indicated above and advised below on the discharge of the patient at the end of the isolation period.

The mother, or nurse, need not be strictly confined to the premises if she shows no symptoms and is careful in her technique. She will need relief and should go out regularly for a little while each day. It is for her protection to get some fresh air and exercise, and she will go back refreshed and can give her patient better care.

Release from Quarantine.—When a patient is ready for discharge from isolation, he should receive a thorough soap-and-water bath and shampoo and fresh clothing should be put on.

The patient's room and bath can be made non-infectious without destroying draperies, rugs, or repainting and papering. The room, as a whole, is quite free from infection at all times and particularly by the time convalescence is established. It is only those things which come into immediate contact with the patient which are dangerous. However, a careful cleaning process should be carried out.

All dishes and utensils small enough to be put in a boiler or large pan should be taken from the room and put directly into the boiler or pan and boiled for at least ten minutes. Larger ones should be washed and scalded with boiling water. Such articles as thermometers and other glassware and other nursing articles can be put into solutions (enough to cover) of sulphonaphthol, a teaspoonful to the pint, carbolic acid solution one part to sixty of water or alcohol (denatured) 70 per cent., and allowed to stand for half an hour. Rubber goods, toilet articles, and other things which would be harmed by antiseptic solutions may be washed with soap and water and put out in the sun and air.

Soiled washable linen and clothing should be taken from

the room and put directly in a boiler or large pan in which it should be boiled for fifteen to twenty minutes before washing. Blankets, puffs, quilts, draperies, etc., which cannot be washed, should be hung out in the sun for at least six hours.

The furniture should be washed with soap and water. For mahogany and other nice furniture a mild soap should be used.

Upholstered furniture, carpets, rugs, etc., should be put out in the sun and aired for six hours at least or, better, on two successive days. So should the mattress and pillows. Good books and expensive toys may be wiped over with soap and water and put out in the sun and air or sent to some contagious hospital. The remainder should be burned.

All refuse, papers, etc., should be taken to the stove, furnace, or out-of-doors to be burned. Kerosene poured over poorly burning material helps combustion. The floor, doors, and finish should be washed with soap and water.

The bathroom contents should be subjected to the same cleaning process. It should then receive a thorough soap-and-water cleaning, including shelves, lavatory, toilet, bathtub, floor, woodwork, and lower part of the walls if they are washable.

It is well to air the room for a couple of days if possible. Those things which are put out in the sun and air should be put out in the morning and kept out all day directly in the sunlight.

The well children of the family who have been away during the patient's illness may now be allowed to return, although it would be safer to postpone it a week if possible. Children suffering from infectious disease are sometimes carriers of the disease germs in their nose, throat, etc., even after they have been released from quarantine, so that the patient should sleep alone for two or three weeks if possible and certainly should not sleep with other children. During this time also kissing on the mouth should not be permitted.

When secondary cases do develop it probably always is due to infection from the patient or by another member of the family who has had the disease in mild form or is a carrier. If the patient's room has been treated as already outlined there need be no worry that it will be a source of infection.

PART II

Aseptic Nursing Technique

Foreword.—Employees are held responsible for the complete and conscientious observance of the technique described below. This requirement is necessary not only to prevent the spread of infection from patient to patient but also to insure employees against contracting infection from patients.

Definitions and Explanations.—The causative germs of infectious diseases are most virulent while the secretions and excretions, in which the germs escape from the body, are in a fresh state. This explains why it is difficult to prevent the spread of infectious disease in hospitals. These fresh secretions and excretions must by appropriate methods be disposed of promptly. The germs usually enter the body through the mouth or nose. The infection is most frequently conveyed by means of contaminated hands or by direct contact, as by kissing, etc.

Transmission.—Most infectious diseases are transmitted by actual contact, direct or indirect. Air transmission is so rare that it need not be considered of practical importance, except that nurses must not allow patients to cough into their faces. There are some infectious diseases which are transmitted by special means, malaria by the Anopheles mosquito, etc. Such diseases are not transmitted by contact and are combated by certain definite procedures.

Contamination.—Anything which has come, directly or indirectly, in contact with a patient or an infected area is considered *contaminated* or infected.

A **unit** is an infected area which includes the patients in any room who are suffering from the same disease. Such

an area may include a bed or group of beds and also the bedside tables, chairs, gowns, thermometer shelves, etc., used for the patient or patients in the unit.

Asepsis.—By asepsis it is possible to confine the disease-producing germs to a single unit. The whole object of the aseptic technique is to prevent the transmission of disease germs from one unit to another by means of the interruption of contact, both direct and indirect. Direct contact between patients in different units is prevented by placing beds a safe distance apart; by depending on the honesty of patients; or by putting them in separate rooms or cubicles. Indirect contact between units is attained by employing a technique similar to that employed by surgeons, but which, when used in the manner hereafter described for medical cases, is called *medical asepsis*.

ADMINISTRATIVE TECHNIQUE

Ways to Avoid Infection.—Keep fingers, pencils, pins, labels, and everything out of your mouth.

Put nothing into your mouth except food and drink, and these only with clean hands.

Wash your hands often, and always before eating. Keep out-of-doors as much as possible and sleep with your window open.

Never kiss a patient nor eat anything a patient offers you.

Do not touch your face, head, clothing, or anything outside the patient's unit until your hands have been scrubbed for two minutes.

Be careful that patients do not cough or sneeze into your face. If they do, wash your face thoroughly with soap and water.

Do not allow patients to touch you unless you are gowned, and then only the outside of the gown itself or your hands. Always put on a gown when doing anything for a patient in which there is danger of contaminating your uniform.

Nurses should always report *at once* any soreness of throat or other acute symptoms, and any abrasion or wounds on the hands.

Prophylaxis.—All employees of the hospital must show evidence of recent vaccination against smallpox or submit to revaccination. Graduate nurses, physicians, and certain other permanent employees should have a Schick test done and be immunized if found susceptible to diphtheria. They should also be vaccinated against typhoid fever. It is useless to insist on these two last named procedures for pupil nurses in special training-schools, because they are under training for only three months. Immunity cannot be produced in so short a time. These methods of protection against diphtheria and typhoid fever should be insisted on

early in the nurses training. It should be the duty of all training-schools to have their students immunized against these two diseases.

Nurses, and others who work on the wards, must have diphtheria cultures taken when they first go on duty. Nurses, before returning to their own hospitals, must be examined and have cultures taken before they leave, and are detained if they show any signs of illness or if their cultures are positive.

Health Certificate.—Kitchen employees, waitresses, steward and assistants, and ward maids must have a health certificate when engaged and submit to reëxamination every six months.

Staff Illness.—All hospital employees should be carefully supervised, especially all those who come in contact with patients or who work in kitchens, dining rooms, and about food supplies. Every employee who is actually ill, however slightly, should be taken off duty until a diagnosis is made or he is free from infection. It is essential to the successful conduct of the hospital that employees conscientiously report at once a sore throat, rash, or other symptoms of acute illness. They might have some infectious disease in such mild form that it may be overlooked if they do not report every slight illness. Infectious disease among employees not infrequently is the source of infection of other employees and of patients unless careful supervision of the entire staff is maintained. Early recognition of disease among employees usually insures a milder course and more rapid recovery.

Dormitories and Dining Rooms.—The nurses may live in the same home and eat in a common dining room. They may leave the hospital at any time when off duty so far as the danger of infection is concerned, if they are perfectly well and have observed the technique carefully. The same policy is pursued in the case of all other hospital employees.

Employees Visiting Patients.—No employees, except persons who have duties in the wards, are allowed to enter them. Those who do, need not change outside clothing

nor wear gowns so long as they keep out of the infected areas.

Nurses' Uniforms.—Nurses wear short-sleeved uniforms, a bib, apron, and cap. It is not necessary that the nurses change their uniforms when going on or off duty.

Physicians' Uniforms.—Physicians must wear white duck suits and beneath the coat is worn a special short-sleeved jacket. When a physician goes to the ward to examine new patients or to make rounds, he should leave his coat in the ward admitting room or uninfected corridor and roll his sleeves up to the level of the special jacket sleeve, unless he wears a short-sleeved shirt. If a careful examination of the patient is to be made, or a throat examined of a patient who is likely to cough upon the doctor, he should always wear a gown. During the making of rounds a gown is not necessary unless an examination is made or treatment is to be given which would endanger the doctor's clothing becoming contaminated.

Examination of New Patients.—It is the duty of the resident physician to examine new patients promptly and to make a diagnosis if possible. If this cannot be done, the patient should be isolated in a separate unit until a definite diagnosis can be made. It is very important to know whether or not the patient has been exposed to any infectious disease other than the one for which he is being admitted. If so exposed, it is necessary that he be isolated during the incubation period of the disease to which he has been exposed. After the examination the physician should write in the order book in what unit the patient shall be treated.

Supervision of Patients.—It is equally important to watch carefully all patients in the hospital for the onset of other contagious diseases. When a patient is found to have an unexplained temperature, rash, eruption, membrane in throat or nose, nasal discharge, cough resembling whooping-cough, or other suspicious signs, such patient should be isolated in a separate unit until a diagnosis can be made. House officers must visit all patients in the

morning and afternoon, and seriously ill patients again in the evening.

Discharge Examination.—A very careful examination should be made of every patient shortly before discharge. The purpose of this examination is to make sure that the patient is entirely well and that it is safe for the family to have him return home. This examination is to be recorded on the *discharge examination form*, and a complete diagnosis should also be recorded together with any operative procedures.

Observance of Technique.—It is highly important that the house physicians carry out the technique conscientiously and as prescribed. This applies both to the ward and ambulance technique.

Taking Blood from the Arm for Tests, Etc.—The following technique is used in taking blood for Wassermanns, Widals, and blood cultures. All apparatus used is placed upon a clean or sterile towel on the bedside table. The area over the median basilic or median cephalic vein is sterilized. A tourniquet is applied, the needle is inserted, and the required amount of blood is withdrawn into a test-tube or into a sterile glass syringe. The nurse (uncontaminated) holds a sterile tube into which the blood may be transferred from the syringe. It will be noted that the blood is now in an uninfected tube, or the syringe or tube containing blood may be washed off with phenol solution, 1/60. It is then ready to be taken to the laboratory.

Taking Blood Pressure.—All apparatus used is placed upon a clean towel or sheet on the bedside table. The patient is brought over to the side of the bed and a clean sheet thrown over the bed extending up and under the arm, while the arm is held up by the patient or an assistant. A clean towel is then wrapped about the arm and over it the cuff is applied. The apparatus may stand on the table, or on the clean sheet that covers the bed. One hand (now contaminated) takes the pulse, while the other manipulates the bulb. When the readings have been made the hands are scrubbed, the cuff removed, and the appa-

ratus taken from the room without disinfection. It may be necessary for a nurse to put on a gown to control the patient or hold his arm.

Treatment.—Whenever any operative procedure in the patients' unit is performed, the physician wears a gown. Instruments, syringes, etc., are disinfected after use (see Ward Technique). The physician scrubs his hands as usual.

Visitors.—It is important that resident physicians observe the rules under Ward Technique in admitting visitors. Visitors are not allowed to enter patients' rooms except to see dangerously ill patients, or unless they have permission from the superintendent or one of his assistants.

Autopsies.—Gowns and gloves are worn during autopsies. Gowns are afterward thrown into a receptacle provided for them. Gloves and instruments are returned to the laboratory where they are sterilized. The morgue table, sink, and floor are cleaned with a hose with hot water.

Visiting Physicians.—Resident physicians when making rounds with the visiting physicians, or accompanying an outside physician to see a patient, must, in a courteous manner, insist that the ward technique be observed.

Delivery of Supplies to Wards

Delivery of Drugs.—Drugs are sent to the wards in bottles, paper boxes, and paper bags; they are carried to the ward in baskets and delivered to the nurses' desk, an uninfected area.

Delivery of Nursing and Housekeeping Supplies.—These supplies, ordered on daily, tri-weekly, and monthly requisitions, are delivered to the serving kitchen or linen-closet, uninfected areas.

Delivery of Food Supplies.—These are delivered to ward kitchens directly or by dumb-waiters. Such articles as sugar, tea, coffee, etc., are delivered in paper bags. Butter is wrapped in paraffin paper. Bread is delivered

in loaves wrapped in paraffin paper. Milk is taken to the dumb-waiters in 10-quart cans, from which are filled the pitchers sent from the ward serving kitchen, or is delivered in bottles.

Delivery of Cooked Food.—Cooked food is sent to the ward kitchen in special containers and dishes. These are delivered to the ward on the dumb-waiter or carried by the porter. The empty dishes are afterward collected by porter and returned to the main kitchen. These dishes need not be sterilized before being returned to main kitchen, as the ward-serving kitchen is an uninfected area. Individual dishes which are sent from the diet kitchen to be served to the patients must be sterilized before they are returned to the diet kitchen. The food truck is washed twice a day.

Delivery of Ice.—Ice is delivered to wards on a special truck. When the porter reaches the basement of each building he takes up ice for each refrigerator and cracked ice for ice collars, etc.

Ambulance Technique

Before Starting.—When notified of a call, the ambulance attendant or physician goes directly to the telephone office for the ambulance card. If the patient be a child under twelve years of age he goes to the central linen room where the attendant obtains a parcel of clothing containing night-gown, undervest, and stockings suitable for the age of the patient. He then goes to the garage where he puts on a washable coat. The driver also wears a washable coat. It is the duty of the driver to see that the ambulance is supplied with clean blankets and pillow slips.

At the House.—The attendant, taking a blanket from the ambulance, rings the bell, but gains entrance through the doors, if not opened for him, by using the tail of ambulance coat (outside against knob) to turn the knob. He lays down the blanket and, before becoming contaminated, fills out the ambulance card relating to the social and medical

history of the case, previous illness of the patient, or any other sickness in the house. He then puts the card and pencil into an inner pocket. If the patient be a child under twelve, the ambulance attendant requests a member of the family to remove the patient's own clothing and to put on the clothing which he has brought from the hospital. He then wraps the blankets about the patient, and takes him to the ambulance in his arms. The patient must be kept warmly wrapped and actually comes into very slight contact with the interior of the ambulance. Adults who are slightly ill may walk to the ambulance.

Fig. 10.—Bags in stables for infected blankets, coats, and pillow cases.

A stretcher is used when necessary, and the attendant obtains the history and has the clothing changed as described above before touching the patient. The ambulance driver helps in the removal of the stretcher cases, but handles the patient only when absolutely necessary.

At the Hospital.—On the arrival at the hospital, the patient is taken to the bed prepared for him. The attendant takes care to have some one open the doors for him, the driver if uncontaminated, otherwise a nurse. The patient is placed on the bed, when the nurse takes charge of him. The attendant returns the blankets and

pillow to the ambulance, then removes his coat, throwing it into the laundry chute, scrubs his hands for two minutes with brush, soap, and water. He completes the ambulance card and gives it to the nurse. He also notifies the admitting physician if he has discovered any other disease at the house, or in anyone to whom the patient has been exposed.

The driver, having recovered the blankets and pillow, returns to the garage, throws his coat into the laundry bag, and scrubs his hands. After each call the pillow slips and blankets are placed in the laundry bag, and the interior of the ambulance, wherever it has come in contact with the patient or attendant, is washed with soap and water. Fresh pillow slips and blankets are then put into the ambulance.

Porter's Technique

Changing Beds.—In case a bed is to be substituted for a crib, or vice versa, the porter takes apart the bed or crib, which has previously been washed, and removes it to the storeroom. He then takes the other from the storeroom to the ward and sets it up.

Removal of Infected Mattresses and Pillows.—The porter goes to the ward, puts on a clean gown, and takes the mattress or pillows out-of-doors (someone opens the door if it is closed) to the sunning frames, or to the sterilizing room, where they are placed either in the sterilizer or on the platform reserved for infected articles, where they remain until the sterilizing is done. The porter throws his gown into the soiled linen receptacle and scrubs his hands.

Delivery of Clean Mattresses and Pillows.—Fresh mattresses and pillows are delivered by the porter from the storeroom to the patient's room, which has previously been cleaned. He need not wear a gown or wash his hands.

Steam Sterilization.—Articles to be sterilized are collected at regular intervals by the porter and taken to the sterilizing room, where they are placed in the sterilizer or on the platform for infected articles. Small bundles are

sterilized in a small autoclave unless there is an amount sufficient for using the mattress sterilizer. After sterilization the bundles are returned to the wards.

Sterilization of mattresses, pillows, and other articles which are not damaged by steam is accomplished by steam under pressure of about fifteen pounds for about thirty minutes.

Cleaning Rooms.—Porters need not wear gowns when cleaning patients' rooms.

Transferring Patients.—If a child, the porter, wearing a gown, carries the patient to the ward or room designated. If a stretcher is necessary a second porter will be needed. The stretcher is then put out in the sun or washed with soap and water. The porters then throw the gowns into the laundry chute and scrub their hands.

Removal of Bodies.—If the body is that of a child, one porter is called to the ward. Wearing a gown, he carries the body in his arms to the morgue. Doors are either opened, left open for him, or else he opens them himself by using the inner side of the gown. If the body is that of an adult, two porters are required. After putting on gowns, they carry a stretcher to the room and lay it on the floor; the body is carried to the basement where it is placed on a truck. After delivery to the morgue the porters put their gowns in the basement laundry bag and scrub their hands. The morgue, the table, and floor are washed with hot water by hose periodically.

Removal of Garbage Refuse.—Swill and refuse are deposited in galvanized cans with covers; cans and covers being marked for their respective wards. The porter collects these on a special truck. He goes to each ward from the tunnel, leaving the door open, carries the cans down without closing the door, and empties the refuse cans into a barrel and puts the swill cans on the truck. He wears a gown, using the inside of it if necessary to open the doors. When he has collected a load, he takes it to the incinerator and empties the refuse into it, and proceeds to the swill room, where he empties the swill cans into barrels.

He then places the cans into a large iron tank, where he washes them with hot water. The cans are then returned to the proper wards; in the last ward the porter throws his gown into the laundry bag. He then puts away his truck and scrubs his hands.

Laundry Technique

All clothing which falls into the clothes bag at the foot of the ward chutes, and all blankets, coats, etc., from stables, are considered infected. When collecting infected linen the laundryman wears a gown and washable cloth gloves. The two-wheeled truck on which the bags are

Fig. 11.—Showing bag of soiled linen collected from the basement, and ready to be emptied into the washer.

collected is kept in the laundry. He takes this down the elevator and through the tunnel to the basement of the ward and into the room where the infected clothing falls from the chute into a large canvas bag. He unhooks the bag from the frame and puts up an empty one. He puts

the full bag on the truck and takes it to the laundry. He opens it before the washer and puts all the clothing into the washer except colored clothes and blankets, which are thrown into separate barrels near washers kept for the purpose, and which are marked "infected." If the washer is loaded, he starts it, and repeats his trip, returning the empty bag at once to the ward basement, until the bags have been collected from all the wards. Whenever pulling the elevator rope, opening a door, or starting the washer the laundryman slips off a glove and uses his clean hand or the inside of the gown. On returning, after collecting all the clothing, he throws gloves and gown into the washer and scrubs his hands. Infected coats and linen from the stable are brought to the laundry in a canvas bag by the stableman, and are placed in a barrel plainly marked "infected."

Washing is done in the manner usual in hospital laundries. The clothing must be in the washer for about one hour, cold or hot water being run into the washer and heated to near boiling by live steam. The temperature of the water should reach about 95° C. The linen is then free from infection and can be removed to the extractors and thence to the ironing room without danger. Blankets and colored clothes are washed in lukewarm water and are hung out-of-doors or put into the dryer.

Delivery.—The clean linen is done up in square pieces of cotton cloth tied at the four corners, sufficient in size to make a bundle easy to handle. These are piled in a large delivery basket on wheels and are taken through the tunnel to the central linen room.

WARD TECHNIQUE

Method of Isolation

A Ward.—The term "ward" as used later includes all rooms on a floor and in charge of one head nurse.

Areas of Infection.—In all wards infection is confined to the rooms occupied by patients. Corridor, operating room, diet kitchen, linen closet, and most utility rooms are free from infection. Infected toilets in the utility rooms are marked by cards that indicate which patients may use them. Patients are not allowed in the uninfected area without permission. Communication between the uninfected area of wards and other parts of the hospital is not restricted in any way.

A **unit** is an area which represents a separate and distinct infection; such an area may comprise a single bed, a group of beds, or an entire room, each unit being occupied by patients suffering from the same infection. If beds in the same room are occupied by patients in different units, they should be placed not less than 5 feet apart. Each patient is provided with a bed, bedside table, and chair, and each unit with a thermometer shelf and wall-hooks for gowns.

Kind of Cards Used to Designate Units.—The units are indicated by cards posted on the bed or at the entrance to the room. The cards are of five kinds—DETENTION, CONVALESCENT, BARRIERED, NON-INFECTIOUS, and also BARRIERED with black numbers affixed.

Detention and Convalescent.—The detention card is used in one-disease wards to designate new patients who on admission are suffering from the disease which is treated in that ward. This card is kept in place for one week, when the patient is transferred to another room where patients suffering from the same disease are convalescing and whose unit is marked CONVALESCENT,

or the patient may remain where he is, but the DETENTION card should be replaced by a CONVALESCENT card.

Barriered Cards.—If a patient is admitted to a ward in which only one disease is treated, for instance, scarlet fever, and is found to have some other infection, his unit must be marked by a BARRIERED card. In isolation wards only BARRIERED and NON-INFECTIOUS cards, or BARRIERED cards with numbers affixed, are used.

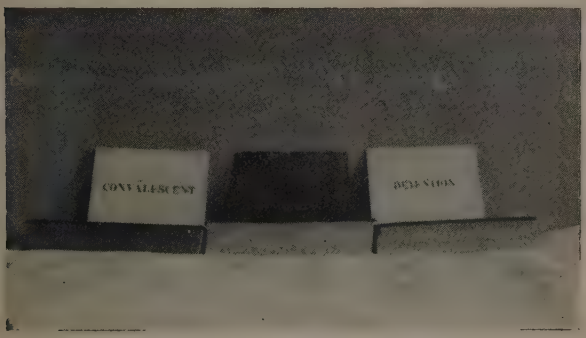

Fig. 12.—Showing cards used to designate units.

Non-infectious Cards.—Some diseases have a low degree of transmissibility. Some patients suffering from infectious disease may stay in the hospital for a long time because of complications, yet are free of infection. These patients may be cared for safely without a rigid technique if dishes, bed-pans, urinals, and other utensils are boiled, and hands, having been soiled with secretions or discharges, are washed. They are indicated by the NON-INFECTIOUS cards.

Placing of Cards.—Cards are put in holders which are placed either at the entrance to the room, or are hung on the bed.

SIGNIFICANCE OF DIFFERENT CARDS

Different Cards in Same Room.—When a card is placed on the door or near the entrance to a room, all patients in the room are in the same unit and are allowed to mingle unless there is some other card on a bed. When more than one bed in a room is marked by a BARRIER card, each bed so marked is treated as a separate unit. When beds are marked with BARRIER cards with numbers affixed, all beds having like numbers are in the same unit, and those having unlike numbers are treated as separate units.

One-disease Wards.—A whole ward may be devoted to one disease, for instance, scarlet fever or diphtheria. Such a ward is called a one-disease ward. It is true, however, that patients suffering from various diseases frequently occupy side rooms in such a ward, but the ward is chiefly used for one disease. All new patients suffering from this disease are held in small side rooms, containing from one to three beds, for a one-week period of observation. To indicate that these are new cases a DETENTION card is used. At the end of the one-week observation period, if the diagnosis proves to be correct and there are no infectious complications or exposure to other diseases, the patient may or may not be transferred to another larger room, for convalescents. In either case the unit in which he is treated is indicated by a CONVALESCENT card. If the patient is not suffering from the disease cared for in that ward, he may be transferred to another ward or, more frequently, remains where he is. The unit in which he is treated is indicated by a BARRIERED card.

Isolation Wards.—All other wards are called isolation wards. On these wards are used only BARRIERED

cards, BARRIERED cards with numbers affixed, and NON-INFECTIOUS cards.

Bed Isolation System.—This term refers to the system of caring for patients suffering from different diseases in the same room without any physical barrier between the beds. Near each bed, on a cleat on the wall, are two hooks for gowns, and near-by is a small shelf for patients' thermometers, etc. On the cleat is pasted the same number as is put on the corresponding bed or beds to denote that gowns, thermometers, etc., are to be used only on patients in the beds marked by the same numbers. It is not wise to attempt to bed-isolate in an open ward or in the same room patients suffering from measles or chicken-pox during the first week of these diseases.

Fig. 13.—Showing isolation ward E, Providence City Hospital, all single rooms. Note the window beside the door of each room.

Aseptic Technique

Aseptic Technique.—The above directions explain how patients suffering from various diseases are separated into units by a card system. It is futile to attempt to carry out aseptic technique in the care of infectious diseases on the same ward unless the patient is always confined to his own unit. A unit may include a room for one patient or

one for several patients having the same disease. Or it may include only single patients or groups of patients in a room containing several beds. Direct contact is prevented because the patients are too sick or too small to get out of bed, by putting them in different rooms or cubicles, or by trusting the patient not to get out of bed.

The aseptic technique which follows is designed to prevent infection being transmitted from one unit to another, and must be rigidly carried out.

Fig. 14.—Showing how a gown is folded and hung up.

Nurses' Uniforms.—The same uniform is worn when on or off duty. The nurse must change, however, if it becomes contaminated. The sleeves must be of elbow length.

Gowns are hung in each patient's unit. They are worn by nurses for any work which involves intimate contact with the patient. The gown is taken from the hook and slipped on in such a way that the nurse does not become

contaminated. After finishing her work the nurse scrubs her hands for one minute and folds the gown down the middle so that the inside surfaces come together, and

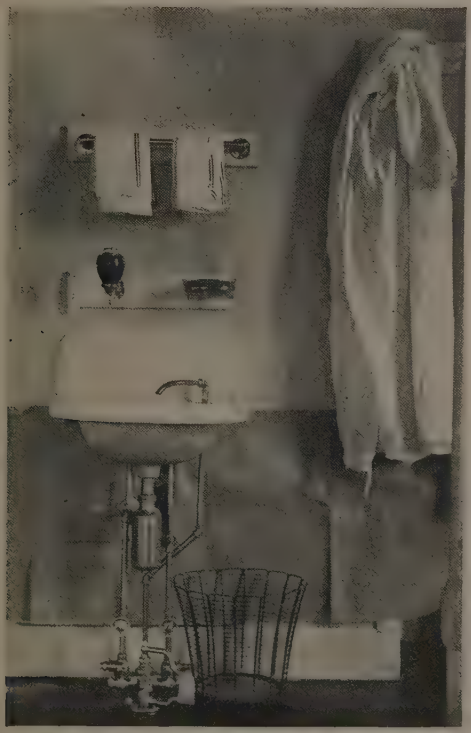

Fig. 15.—Lavatory for hand scrubbing. Note foot-valve, scrub dish, liquid soap container, individual towel, receptacle for used towel. A two-minute sand-glass timer hangs on cleat beside the liquid soap container.

hangs it on the hook in such a way that it can be slipped on again without touching the outside of the gown. Finally the nurse scrubs her hands again for two minutes. If no gown is worn, the nurse must not allow any of her

clothing to touch the bed or anything in the patient's room, and she contaminates only her hands or forearms, which can be scrubbed with soap and water. Gowns are changed at least twice a week and oftener if soiled with secretions.

Ward Maid.—The ward maid washes dishes, cares for diet kitchen and all utility rooms and toilets, etc., and sweeps and mops all stone floors. Gowns must always be worn by the maid when mopping floors (considered contaminated), also when cleaning in contaminated areas such as the combined utility and toilet rooms used by patients. After cleaning in an infected area the gown is thrown into the laundry chute and hands are scrubbed. While working about the kitchen a gown need not be worn.

Scrubbing of Hands (Without Gown).—Proceed to the lavatory and turn on water with the forearm or foot, securing a mixture as warm as the hands will easily bear. Invert the sand-glass (a two-minute glass) and proceed to scrub the hands for two minutes, using the liquid soap and running warm water freely. When finished, turn off the water with forearm or foot, wipe the hands on an individual towel, drying particularly the wrists and back of hands, and throw the towel into the receptacle for soiled towels. No plug is allowed in the bowl.

Scrubbing of Hands (With Gown On).—Before touching the patient go to the gown belonging to that unit, and with hands, palms toward each other, open the rear of the gown, slipping the hands into the sleeves. Tie the gown. After finishing with the patient proceed to the lavatory and turn on water as above and wash for one minute. Then untie the strings of gown and hang upon the hook in such a manner that the inside will not come in contact with the outside. Go back to the lavatory, turn the sand-glass, and scrub for two minutes, proceeding as when the gown is not worn.

Hand Disinfection.—After handling a patient suffering from measles, chickenpox, smallpox, or when ordered, after scrubbing hands, they should be immersed one min-

ute in a 1 : 500 solution of izal, 1 dram to 2 quarts of water.

Admitting Patients.—When the ward is notified that a new patient is expected, a bed is immediately prepared. A bath blanket is spread over the bed. Nightgown, shirt, towels, face-cloth, soap and soap dish, a small amount of phenol solution, 1 : 60, for washing off culture tubes are placed in the unit. On the bedside table, or on a table in the corridor by the door of the room, is placed the admitting tray. This should contain culture tubes, aural and nasal specula, pus basin, throat-sticks, glass slides, also jars containing a thermometer in phenol solution, 1 : 60, absorbent cotton, and vaseline. Stethoscope, head-mirror, and drop-light are also placed on the table. The advantage of putting the admitting supplies on a table in the corridor is that not all of them may be used by the admitting physician, and it saves sterilization of anything not used—for such instruments as are needed can be taken from the table by a clean nurse. A small square of cloth is placed on a table in the corridor near entrance door to receive such of the clothing as needs to be sterilized. A piece of paper and twine are also placed on the table with which to do up clothing to be taken home by the parents. (See care of patients' clothing.) On arrival of the ambulance the patient is placed on the bed by the ambulance attendant, who removes the ambulance blankets and pillow, and returns them to the ambulance. Infection is then confined to the bed and bedside table. The nurse in a clean gown removes patient's own clothing and puts on a hospital nightgown. If the patient is wearing hospital clothing it is unnecessary to change it unless soiled. The patient is then covered with the clean blanket already on the bed. Temperature, pulse, and respiration are taken. Cultures are taken from nose and throat, and from ears, if discharging. Vaginal smears are taken from all girls under fifteen years of age, and note is made of any vaginal discharge. The case is then reported to the office as ready for the admitting physician. The patient

is BED-BARRIERED until he has been seen by the house officer. After examination the physician indicates the unit in which the patient is to be treated and the nurse puts up a card to distinguish his unit, unless he is ordered into the same unit with other patients. The patient is given a bath, the head is examined for pediculi and treated, if necessary. Culture tubes, smears, and instruments used are disinfected in the manner explained under *Sterilization*. The jars containing thermometer, cotton, and vaseline are left in the patient's unit. The gowns, worn by physician and nurse during admission, may also be left in the unit if needed.

Patients' Clothing.—If patients on admission are wearing hospital clothing, note is made of this fact in the clothes-listing book. If the patient is accompanied by a member of the family, the patient's own clothing is wrapped in clean paper and securely tied and given to the parents to take home. The parent must sign the clothes-book to the effect that the clothing has been received, and the nurse's signature must be added as witness. Patients' clothing which cannot immediately be taken home by the parents must be listed in the clothes-book and disinfected as follows: All washable clothing is neatly folded and placed on the small sterilizing square. Hats, coats, dresses, furs, and other outer clothing are tagged with the patient's name, put on hangers, and are immediately hung outdoors on the balcony and left for at least six hours. After the nurse has scrubbed her hands she pins up the bundle of clothing to be sterilized, in which is included a duplicate list of the patient's clothing, which is later taken to the sterilizer by the porter. Shoes, gloves, belts, and other leather goods are washed off with soap and water or 1 : 60 phenol solution, and dried in the open air if possible. Money, jewelry, and other valuables, after being washed with soap and water or 1 : 60 phenol solution, are later taken to the office and a receipt for them obtained, which is kept by the head nurse of the ward. The clothing of private patients occupying single rooms need not always

be disinfected on admission, but may be kept in the room. When patients are ready for discharge with terminal disinfection, the same methods of the disinfection of all clothing and belongings which have been used, or kept in the patient's unit during convalescence, are to be carried out.

Suspicious Symptoms.—Whenever a patient not already in a unit alone develops rash, sore throat, sudden rise in temperature, vaginal discharge, or other suspicious symptoms the head nurse should put a BARRIERED card on the bed until the resident physician has been notified and has made an examination to determine whether the patient is developing some other contagious disease.

Rules for Patients Confined to Units.—Patients must stay in their rooms or units unless given permission to go out-of-doors, on the veranda, or to the toilet room. Patients whose units are marked CONVALESCENT, however, may, with permission, visit other units marked CONVALESCENT. This is the only exception to the rule that patients in different units must never come in contact. If children come out of their units, or throw things from one unit to another, they are kept in bed. *Children are not allowed to sit on the floor.*

Patients Going Out-of-doors.—The nurse opens the door for the patient entering or leaving the ward. Adolescents and adults who can be trusted to keep away from other patients, or other people, are allowed out-of-doors without supervision only on written order, and must not leave the hospital grounds, and must not enter any other building. Infraction of these rules is punished by withdrawal of the out-of-doors' privilege. Children may be taken out by a gowned nurse or nurse-maid (someone opening and closing the doors for her). If they are from more than one unit, she sees to it that they do not mingle.

Toilet Privileges.—DETENTION patients and BARRIERED patients during the acute process of the disease must use bed-pans and urinals. In one-disease wards toilets are reserved for convalescent patients. In isolation

wards a toilet may be reserved for a group of patients who are suffering from the same disease and the name of the disease marked on the toilet door; or the names of the patients who may use it may be posted on the toilet door. When the toilet is to be used for patients suffering from another disease, portions of the inside walls of the toilet, and door, with which the patients have likely come in contact, and the seat always, should be washed with soap and water before allowing the next patient to use it.

Transferring Patients.—When a patient is to be transferred, he is first wrapped in a blanket from his bed. A porter, wearing a gown, takes him in his arms, or two porters carry him on a stretcher to the designated ward or room. If a stretcher is used, it is put out in the air or washed with soap and water after the transfer. If the patient is able to walk the porter accompanies him to the ward, opening and closing the doors.

Terminal Disinfection.—If a patient is wearing his own clothing during convalescence he is put to bed the day before discharge to give time for disinfecting his clothing. When a patient is to be given a discharge bath, the clothing is removed in his room and, with a sheet so folded that the outside may be used for the patient to stand on after the bath, he is taken to the bathroom, or may go himself, if an adult. He is given or takes a tub bath of soap and water and a shampoo. A nightshirt is put on, and patient then goes to the Discharge Room.

Discharge Room.—Each ward is provided with a Discharge Room, which is a non-infectious room. When a patient is ready to go home and requires terminal disinfection, he is given a discharging bath and is transferred to the Discharge Room. This bath is given the day before discharge, if possible, and the patient stays in the Discharge Room until the relatives come for him.

Unit Disinfection.—When a patient is discharged, or dies, the following is the method of cleaning the unit occupied by the patient: the bed, bedside table, chair, bell-cord, if used, space where gown is hung, shelf for

thermometers, etc., are washed thoroughly with soap and water. If the patient was in a single room, the lavatory, soap container, brush-dish, gown hooks and cleat, and door-knob are also washed with soap and water and the room aired if possible. Airing is not necessary, however.

Visitors are allowed to see dangerously ill patients at any time, and to see private patients between 1 and 4 P. M. and 7 and 8 P. M. The office also issues a pass to one visitor to each ward patient between 2.30 and 3 P. M. Passes must be presented at the nurse's desk.

Fig. 16.—Charts hanging on wall in corridor beside patient's room.

Visitors must observe the patients from the ward corridors and are never allowed to enter the patient's room without permission. This permission is given to relatives of all dangerously ill patients. To others it is given only by the superintendent or one of his assistants. When a visitor is allowed to enter a room the nurse in charge puts a gown on him and stays near-by, unless she believes that he can be trusted.

Patients' Packages.—All packages for patients must be left in the office and delivered from there to the ward.

Playthings.—When there is more than one unit in a room, the patient's playthings are tied to the bed, if there

is danger of the toys being passed from one unit to the other.

Histories and Charts.—Histories, temperature, and other charts are kept together on the same chart-holder, which hangs outside the door of the patient's room and is never left in the infected area. In taking histories or examining patients, the house officer either carries the facts in his mind, or dictates them to another physician, or a nurse, neither of whom is contaminated. After removing his gown and washing his hands, the house officer immediately

Fig. 17.—Patient signing document without infecting it. Towels are placed underneath it and over it, save for the place of signature.

writes the history, examination, or notes on the permanent history blanks. After the discharge of a patient the nurse completes her records and the charts are taken the following morning to the office.

Signing Documents.—It is not necessary that legal documents or other papers be sterilized after signature. The technique is as follows: A clean towel is laid on the bedside table and the document is placed upon it by the nurse. The document is then covered by one or two towels, save the place for the signature. While the nurse holds the

towels and document steady, the patient to whom an inked-pen has been given, affixes his signature. In this way the document remains uncontaminated. Then the nurse, hands still clean, removes the document. The towels are thrown into the laundry chute and the penholder is washed with soap and water, or phenol solution, 1 : 60.

Serving Meals.—Trays for all patients are set up and served from kitchen or food truck. The nurse goes about and ties bibs on children when necessary. When ready for service, the trays are taken to the various rooms and placed either on the bed or on the bedside table. They can usually be delivered without contaminating the hands. She then puts on a gown and feeds the small children, changing gown and scrubbing hands when passing from one unit to another. After meals the contaminated trays are placed upon the food truck, on which they are wheeled to the door of the ward kitchen, from which they are transferred to the dish sterilizer; or the nurse making the collection individually takes them to the kitchen sterilizer, in which she deposits them. Remnants of food are thrown into the garbage can, which stands near the sterilizer, the cover having previously been removed. When the dishes and trays have been stacked in the sterilizer the nurse scrubs her hands and turns on the steam. Odd dishes between meals are allowed to accumulate in the sterilizer until a sufficient number have been collected, when they are sterilized. Drinking and medicine glasses are boiled in a kettle over gas.

Serving Medicine.—When the medicine tray has been prepared the nurse takes it about the ward, passing out each dose to patients who can take it themselves, or leaves it on the bedside table of all small children. When she has completed delivery she puts on a gown and gives the medicine to the small children, scrubbing hands and changing gowns between units. The medicine glasses are collected later.

Taking T. P. R.—Patients have individual thermometers. Thermometers are kept in covered glass jars contain-

ing 1 : 60 phenol solution. When there is only one patient in a unit, the temperature, pulse, and respiration are kept in mind, the hands washed, and the data at once recorded. When there are several patients in the same unit, the nurse takes the temperature, pulse, and respiration and records them on a slip of paper in the unit. After removing her gown and scrubbing her hands she copies the data on her charts which hang near the door of the room. To do this she leaves the slip in the contaminated area where it can be easily read, or a convalescent patient may hold it for her.

Bed Making.—When making beds the nurse wears a gown, changes it, and scrubs her hands between units. The bed-clothing is placed on the patient's chair or table while the bed is being made. Bed linen is changed as frequently as necessary, and always once a week.

Taking Nose and Throat Cultures.—At least two cultures are taken from all new patients unless the first is positive. At least two successive negative cultures are required before discharging a patient who has had positive diphtheria cultures. Patients suspected of having diphtheria must have at least five successive negative cultures before they are certified as not having diphtheria. Before taking the cultures two tubes of medium are marked, one "nose," the other "throat." These, with a tube containing two sterile swabs, are taken to the bedside. In taking cultures of adults, or of children who do not resist, a nurse puts on her gown, removes one swab (smaller one), swabs both nares, and it is then rubbed over surface of medium in the tube marked "nose," and this tube is plugged. The other sterile swab is removed and, the first being replaced in the same tube, this swab is rubbed over the throat, particularly the tonsillar region, on both sides. This is then planted on the medium in the tube marked "throat," and this tube is plugged and the used swab replaced in the swab tube. If the patient is resistant, a gowned nurse holds the patient and a second gowned nurse takes the

cultures as above. The culture tubes are later wiped with a towel wet with phenol solution, 1 : 60, after the nurse has scrubbed. The tubes are labeled with name of patient, the date, and ward.

Other Cultures.—This technique applies to taking all kinds of cultures, differing only as to the parts cultured.

Smears.—Provide clean slide and sterile swab. The nurse puts on a gown, obtains an appreciable amount of secretion on the swab, and this is well spread over the slide, making a thin film. After drying, the slide is put in a small envelope previously marked with the patient's name, ward, date, and source of smear. This envelope is then sealed.

Delivery of Specimens.—All specimens should be delivered to the laboratory and put in designated places. Care should be taken to keep culture tubes right side up.

Hypodermic Injection.—The nurse carries to the patient's room the hypodermic syringe, previously filled at the medicine closet, and a small piece of cotton wet with 65 per cent. alcohol. The part to be injected is wiped with cotton wet with the alcohol and the injection is given. The cotton is put in the waste bag and the syringe and needle are flushed with and submerged in phenol solution, 1 : 60, for ten minutes.

Administering Antitoxin.—On the antitoxin tray, covered with a clean towel, is placed a small eye-bowl, antitoxin syringe and needle, two medicine glasses, cotton on end of toothpick, small square of adhesive plaster, cotton swab (sterile), all covered with a towel when not in use.

Preparation.—One medicine glass is nearly filled with alcohol, 65 per cent., and the syringe with needle attached is flushed three to four times with this solution. The alcohol is emptied and the glass filled with sterile water. The syringe and needle attached are flushed three to four times with sterile water and placed on the tray. The sterile water is then put into the eye-bowl. The syringe is filled with antitoxin directly from the bottle, and left

on the tray. The toothpick swab, wet with tincture of iodin, is put into the first medicine glass. A small amount of liquid soap is added to the water in the eye-bowl. The nurse carries this tray to the patient's room and places it on the bedside table. She then puts on a gown, exposes the part to be injected (the outer part of the thigh), and sterilizes a small area with tincture of iodin. Taking the syringe in one hand, after having expelled the air from it, she picks up the skin with the other hand and plunges the needle quickly and deeply into the muscle. The antitoxin is given slowly to avoid pain, the needle removed, and a piece of sterile cotton put on the spot and held in place with a piece of adhesive plaster. The syringe is then rinsed three to four times with liquid soap and water, which are in the eye-bowl on the tray. The nurse covers the patient and then removes her gown. The tray and its contents are then removed from the patient's room. The medicine glasses are boiled, the syringe and needle are thoroughly flushed with phenol solution, 1 : 60, plunger and needle removed and submerged in the phenol, where they remain for at least ten minutes. With clean hands the nurse wipes the tray and eye-bowl with a clean towel wet in phenol solution, 1 : 60. After all these are disinfected the tray is again set up.

Nasal Irrigation.—Instruments used: irrigation can with tubing, No. 12 F. catheter, warm solution, basin, and a small piece of rubber sheeting. The nurse puts on a gown, holds the child's head over the basin, and inserts the catheter into the nares, first one and then the other, getting a return from the other naris if possible. The can should hang not more than one foot above the head of the patient. The can and tubing are left by the bed; the nurse scrubs her hands and removes gown; the basin and catheter are boiled. The nurse should be careful not to allow secretions to be blown into her face.

Aural Irrigations.—Instruments used: ear syringe, eye-bowl, pus basin, warm solution, and cotton swab. The nurse puts on a gown, fills the syringe, expels air, and asks

the patient, or another nurse, to hold the basin to catch the fluid. After finishing the operation the nurse dries the ear with cotton and scrubs her hands as usual. Utensils are either washed and returned to the patient's table or boiled and put away in the cabinet. Drops or powder to be used after irrigation are left on the shelf in the unit.

METHODS OF DISINFECTION

Utensil Sterilizers.—Each ward is equipped with two large utensil sterilizers, the covers of which are operated mechanically. One is for dishes and is in the kitchen. The other is for utensils, such as basins, foot-tubs, bed-pans, urinals, etc., and is in the utility room. When the articles to be sterilized have been placed in the sterilizer the nurse scrubs her hands (if they have been contaminated), and

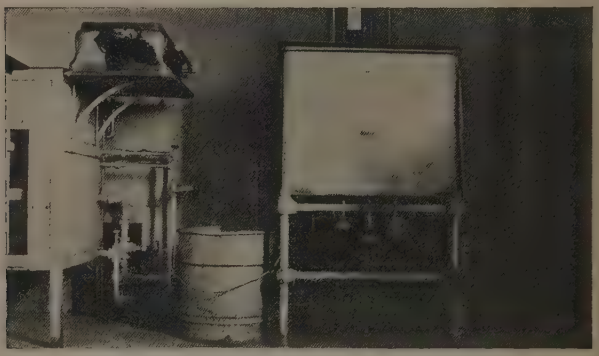

Fig. 18.—Utensil sterilizer, with swill can beside it. Each ward is equipped with two large utensil sterilizers, the covers of which are operated by a foot lever. Articles are left in the sterilizer fifteen minutes after "boiling" begins.

turns on the water, and, after the necessary amount is drawn, turns on the steam. Utensils are left in the sterilizer for fifteen minutes after boiling begins. Dishes, etc., boiled in kitchen sterilizer are then removed and washed.

Articles in the utensil sterilizer are usually wiped dry and put away.

Instrument Sterilizers.—Each ward is equipped with

an instrument sterilizer. Instruments are left in the sterilizer fifteen minutes after "boiling" begins. They are then removed, wiped perfectly dry, and put away in the instrument cabinet. The dissecting, tracheotomy, and other sets of instruments which are to be kept sterile after boiling are wiped with a sterile towel and are placed between folds of sterile towels upon an instrument tray, ready for instant use.

Mattresses and Pillows.—Mattresses and pillows are sent to the sterilizing room for sterilization by steam after cases which have died, or have been taken home, or transferred when dangerously ill, and always in the case of small-

Fig. 19.—Showing a frame on which mattresses and pillows are sunned.

pox and typhus fever, or if possibly infected with lice or bed-bugs. Otherwise they are sunned for six hours (minimum). On stormy days all mattresses and pillows are sterilized by steam. Mattresses are protected by the usual rubber sheets when necessary.

Rubber goods, such as rubber sheets, ice-caps, ice-collars, etc., which cannot be boiled without damage are washed thoroughly with soap and water and dried in the open air and sun when possible. Combs are washed with warm soapy water and a brush.

Bed-pans and Urinals.—All bed-pans and urinals are emptied directly into the hopper and washed with running water. The water is turned on by foot. They are then placed in a utensil sterilizer, and when a sufficient number have accumulated they are sterilized.

Books, letters, etc., are carefully pinned up in a towel marked by pencil and sent to the steam sterilizer. Outgoing patients' mail is marked "sterilize and mail."

Fig. 20.—Slop-hopper operated by foot-valve.

Stethoscope.—The stethoscope, head-mirror, drop-light, etc., are washed with soap and water or 1 : 60 phenol solution before being taken from any unit.

Chemical Sterilization.—Intubation tubes, knives, needles, scissors, and other cutting instruments, etc., after use, are washed with liquid soap and water, soaked in phenol solution, 1 : 60, for ten minutes at least, dried with a towel, and put away. Thermometers are sterilized by immersion in phenol solution, 1 : 60, for at least ten minutes. This solution is used for other non-boilable instruments, etc., or, if in a hurry, for disinfection of any small articles.

Operating Technique.—The operating room is an uninfected area and the infection must be confined to the operating table, instrument table, and etherizer's stool. Everything is made ready for the operation. The patient is brought in and etherized on the table. The nurse in charge of the ward is present to see that there are no

Fig. 21.—Showing method of opening door to laundry chute for disposal of soiled linen. The door has spring hinges.

errors in technique and to wait on the operators. After the operation the patient is removed to his room. Those engaged in the operation remove their gowns and leave them on the table and scrub their hands. The soiled linen is thrown down the laundry chute, instruments are boiled, waste is thrown into the waste can, operating table, instrument table, stool, and floor are washed with soap and water. If there is much blood-stained linen this is done up in a clean sheet and the laundryman collects and washes it separately.

Disposal of Secretions.—In acute cases when necessary a paper bag is opened and attached to the bedside table or on the wall by strips of adhesive plaster; into it pieces of gauze or compress are thrown after wiping away secretions. When secretions are profuse a rubber slip is put on the pillow beneath the linen slip; when necessary the patient is given waste cloths for secretions, and these are thrown into the paper bag as frequently as necessary; pillow cases are

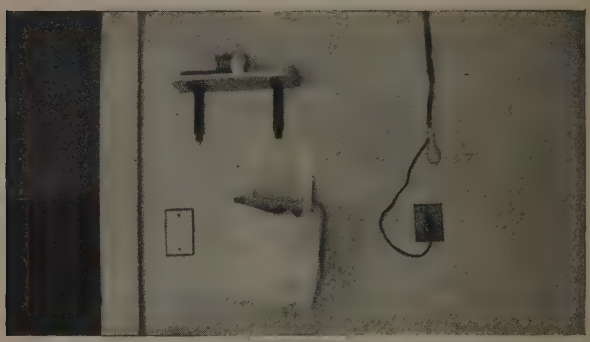

Fig. 22.—Showing paper bag for reception of throat sticks and other waste, sometimes hung on bedside table.

changed frequently. In cases of vaginal gonorrhea all pads are thrown into the refuse can after use. Compress or gauze is put inside the napkins of infants who have gonorrheal vaginitis, and this is thrown away when the napkin is changed.

Disposal of Containers.—Medicine bottles and powder boxes, being uncontaminated, are collected by the druggist. The containers for cooked food are washed in the ward diet kitchen after use and then placed upon the dumb-waiter to be collected by the kitchen porter. All other containers, paper bags, paper dishes, wooden trays, etc., are thrown into the refuse can. Individual dishes served in the patients' rooms must be sterilized before being returned to the diet kitchen.

Disposal of Waste.—Each ward is provided with a garbage can which is kept beside the dish utensil sterilizer; also a refuse can in a utility room. These cans are collected daily.

Disposal of Dropped Articles.—If linen, throat sticks, towels, or any other articles are dropped on the floor, they are considered contaminated and must be destroyed or properly disinfected.

Throat Sticks.—Wooden throat sticks are kept in a container a little shorter than the sticks. When one is wanted for use, the nurse holds them in a box or bag while the physician removes one. The end of the stick opposite that first touched is put into the patient's mouth. After use, they are put into a pus basin or paper bag which the nurse carries, or into a paper bag which may hang from the bedside table.

Disposal of Soiled Linen.—Infected linen is made up into a small bundle and taken to the laundry chute, into which it is dropped, using the forearm to open the chute door. Linen badly soiled with feces, blood, etc., is washed out first at the hopper.

Preparation of Dead Bodies.—Bodies are, of course, considered infectious and the aseptic technique is carried out during their preparation just as in life as long as they remain in the ward. After taking the necessary supplies to the room, whoever prepares the body puts on a gown, and with soap and water washes the body and puts on a shroud. It is then carefully pinned up in a sheet, tagged with name and ward, and the porter is called to remove it to the morgue. The unit is cleaned as after discharge of a patient.

Sweeping.—Before sweeping, the floors are sprinkled with oiled sawdust. The same broom may be used for any floor, but the sweeper never touches anything in the units. The broom is scalded under the hopper faucet after using. However, when sweeping is done in convalescent rooms and the patients are up and about, the nurse must wear a gown and scrub her hands after finishing.

The broom and handle are considered contaminated and must be scalded after use.

Mopping.—One mop is used for all infected areas and is scalded after use. Another mop is used for uninfected areas and is also scalded after use. A gown is worn in both instances.

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